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MENINGIOMAS ARISING FROM THE TUBERCULUM SELLAE

WITH THE SYNDROME OF PRIMARY OPTIC ATROPHY AND BITEMPORAL FIELD DEFECTS COMBINED WITH A NORMAL SELLA TURCICA IN A MIDDLE-AGED PERSON *

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When the question "What's wrong with you?" is put to adult patients who are referred to a neurosurgical clinic, the answer "My sight is failing" is probably in these latter days far more often given than any other. Not infrequently it is the sole complaint. Let us suppose that under these circumstances a detailed examination discloses only two objective findings—an atrophic pallor of the optic nerves and bitemporal field defects or a tendency in that direction. There are no constitutional evidences of disordered pituitary function and the x-ray films of the skull show a sella turcica within the limits of normal. What, then, is a diagnosis? [1]

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It lies within the memory of most of us when the recognition of an intracranial tumor rested on the triad of headache, vomiting and choked disk. Tumors were supposed to be rare, and when on the basis of these so-called cardinal symptoms one was suspected, surgical intervention was likely to be postponed until vision was seriously impaired.

The past quarter century has seen a greater revolution in all this than is generally appreciated. The methods of tumor localization have

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1. An attempt to answer this question was made at a clinic given in the Peter Bent Brigham Hospital on March 15, 1927, for the New England Ophthalmological Society and the Boston Society of Neurology and Psychiatry in combined session. At the time a number of patients were shown in illustration of the parahypophysial tumors and other neurosurgical lesions involving the chiasm, the symptoms of which are often mistaken at the outset for a retrobulbar neuritis. On the request of Dr. George Derby and because of his feeling that the subject was worthy of a larger audience of ophthalmologists, the present paper, which gives an account of but one of the several possible syndromes associated with primary atrophy of the optic nerves due to an adjacent tumor, was presented before the Ophthalmological Section of the American Medical Association, Minneapolis, June 14, 1928.

been vastly improved, the technic of the surgical procedures has been completely transformed, and the microscopic differentiation of the many varieties of tumor, all of which vary in their life history, in their behavior and consequently in their prognosis, is coming gradually to be put on a sound basis.

Owing to these significant advances, those who have to deal therapeutically with the manifold types of intracranial tumor are today far less concerned with their symptomatic similarities, produced by general or local disturbances of intracranial tension, than with their regional and pathologic dissimilarities. Not only is it essential that the presence of a tumor and of its precise location be reasonably assured before it is attacked, but it should be possible to make at least a presumptive guess as to its histologic nature and likelihood of recurrence, for these things will greatly influence the surgical procedure. The goal, in short, is to recognize the peculiar manifestations of a particular kind of tumor in a particular region at the earliest possible stage of the process in order that an operation may be undertaken under the most favorable auspices.

So it is that this paper deals with a well-known type of meningeal tumor whose presence, by the accident of its situation, is betrayed by a characteristic symptomatology long before it attains a large size.

Though the meningiomas [2] differ considerably in their gross appearance as well as in their microscopic structure and rapidity of growth, they nevertheless are all akin. Not only are they variable in their situation, but they affect the adjacent bone in different ways, some of them causing hyperostoses from invasion of the haversian canaliculi, some of them causing pressure atrophy, some of them no change at all. In spite of these variabilities, the tumors have certain definitely favored seats of origin, in each of which they show differences of behavior that provoke a recognizable train of symptoms which is strikingly similar from case to case. For example, the combination of unilateral exophthalmos with marked hyperostosis of the lateral wall of the orbit and temporal fossa is almost invariably associated with a peculiar flat tumor (meningioma en plaque) [3] that spreads over the meninges, covering the anterior and lower part of the temporal lobe without producing any intracranial symptoms whatsoever. Certain other meningiomas, which ophthalmologists should be quick to recognize, take their origin from the basilar leptomeninges in the vicinity of the pituitary fossa. Many of them have a no less distinctive symptomatology than the type just mentioned. Those which

2. Since there are, practically speaking, no other tumors that take their origin from the meninges, it was proposed some years ago to substitute for the unfortunate misnomer "dural endothelioma" the simple term *meningioma*, which is appropriately descriptive, convenient, and connotes all that is essential. They represent about 12 per cent of all intracranial tumors.

3. Cushing, H.: The Cranial Hyperostoses Produced by Meningeal Endotheliomas, Arch. Neurol. & Psychiat. **8**: 139-152 (Aug.) 1922.

arise from the olfactory groove have been considered at another time and place;[4] others with equally unmistakable manifestations arise from the sphenoidal ridge lateral to the sella turcica and implicate the adjacent optic and oculomotor nerves; still others may actually arise from the meningeal expansions constituting the sheath of the optic nerves within the cavity of the orbit.

Several of the more characteristic syndromes were briefly alluded to in the senior author's Cavendish Lecture in 1922,[5] since which time more exact knowledge has been acquired in regard to many of them. This is particularly true of what were then called suprasellar meningiomas, whose precise origin from the tuberculum sellae was not at the time fully appreciated. As these latter tumors in the course of their growth separate the optic nerves and become straddled by the elevated and flattened chiasm, they are of special importance to ophthalmologists. They sound an early alarm because of their position and they may consequently be recognized and operated on more promptly than would a meningioma of comparable size in any other situation, unless possibly in the spinal canal.[6]

CASE REPORTS

The case reports will be given in the chronological order in which the tumors came to be verified. In this way, our slowly acquired familiarity with the syndrome in question, to the point of making occasional correct preoperative diagnoses, will be more evident.

CASE 1.—*Failing vision for nine months. Primary optic atrophy. Advancing bitemporal hemianopsia. Normal sella. Transfrontal operation. Extirpation of suprasellar meningioma causing further damage to one optic nerve but with preservation of nasal vision in the other. Condition stationary after twelve years.*

Nov. 20, 1916: Admission of Karl G., a lawyer 38 years of age, referred by Dr. W. H. Phillips of Cleveland with the presumptive diagnosis of pituitary tumor.

History.—A sister had been operated on unsuccessfully many years before for a spinal tumor said to be an endothelioma. The patient himself, though never of vigorous health, had kept well abreast of life until nine months before admission, when he began to notice an impairment in vision which was not aided by glasses. For three months, reading vision had been wholly lost. He meanwhile had suffered from no discomforts apart from "a feeling of congestion" in the eyes.

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4. Cushing, H.: Meningiomas Arising from the Olfactory Groove and Their Removal by the Aid of Electro-Surgery, Lancet **1**:1329-1339, 1927.

5. Cushing, H.: The Meningiomas (Dural Endotheliomas). Their Source and Favoured Seats of Origin, Brain **45**:282-316, 1922.

6. To determine the comparative frequency of primary optic atrophy in a series of cases in which an intracranial tumor was subsequently verified, the histories of 100 recent consecutive cases have been reviewed by one of us (L. E.) with the following results: On the patients' admission to hospital 41 per cent showed choked disk, 28 per cent a primary optic atrophy, 11 per cent a secondary optic atrophy, 12 per cent an early nonmeasurable papilledema and 8 per cent normal fundi.

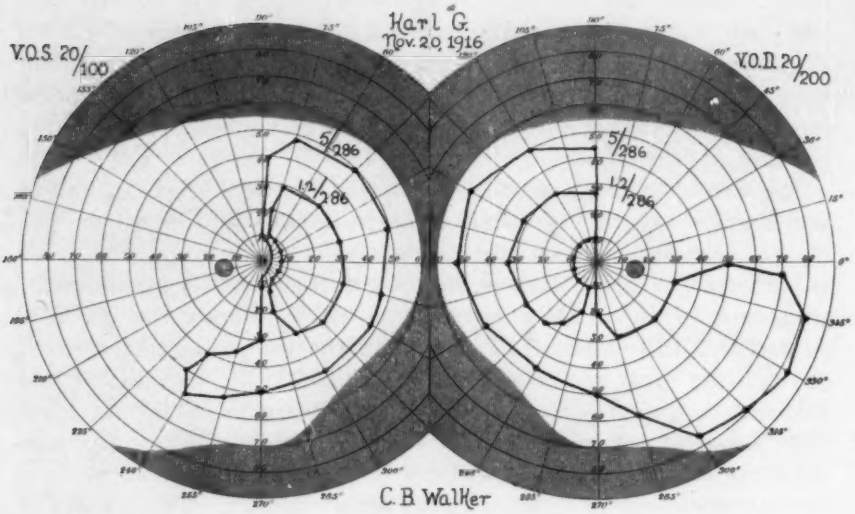

Fig. 1 (case 1).—Patient's fields on admission (perimetric method with 5 and 1.2 mm. test objects).

Fig. 2 (case 1).—Showing small, apparently uninvolved sella (natural size).

Fig. 3 (case 1).—Patient on discharge three weeks after operation, showing practically invisible scar.

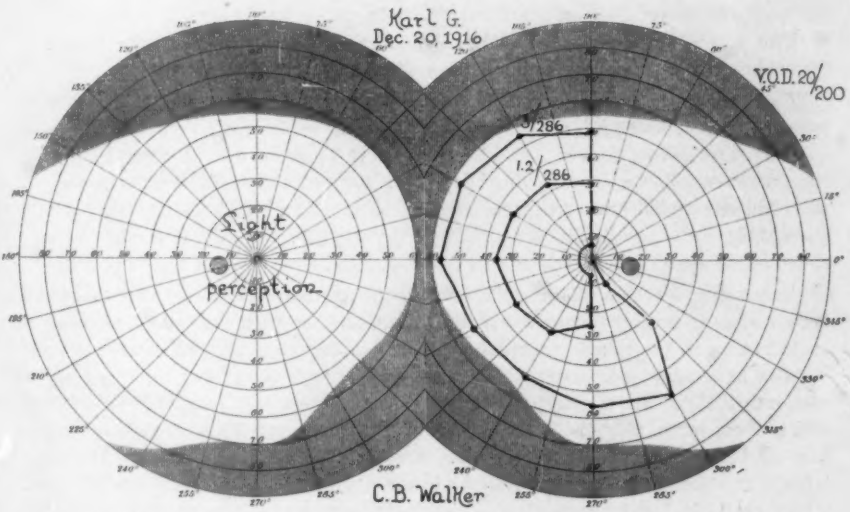

Fig. 4 (case 1).—Patient's fields on discharge (perimetric method with 5 and 1.2 mm. test objects).

He had recently had an intranasal operation with removal of the middle turbinates and exploration of the sinuses, which revealed no infection; still more recently his molar teeth had been extracted, on the suspicion that they harbored some infection.

Examination.—This showed a rather undernourished man with primary optic atrophy, greatly lowered visual acuity (left eye, 20/100; right eye, 20/200) and an incomplete bitemporal hemianopsia (fig. 1). Otherwise the general physical and neurologic examination was quite negative. The olfactory sense was unimpaired. The sella was normal (fig. 2). There were no recognizable hypopituitary symptoms, though the basal metabolic rate was slightly subnormal at −8 per cent.

An exploratory operation was advised, but no presumptive pathologic diagnosis was recorded on the history.

On *Nov. 29, 1916,* a right frontal osteoplastic flap was reflected. The procedure was difficult owing: (1) to unusual vascularity, (2) to an unusually adherent and friable dura, and (3) to the presence of a large frontal sinus which was opened though without injury to the mucous membrane. After elevation of the frontal dura from the roof of the orbit and after incising the reflected membrane along the sphenoidal ridge, the right optic nerve was exposed, beyond which was a nodular, fairly firm, reddish tumor. It was thought to be inoperable, but in order to verify the nature of the lesion some fragments of its anterior portion were removed with the pituitary rongeurs. The growth was found to be relatively nonvascular; and finally, on nibbling away some additional fragments, the posterior portion of the growth suddenly became dislodged, and the intact mass, about 2 cm. in diameter, was tilted cleanly out of its deep pocket beneath the chiasm. Not until this had occurred was the left optic nerve brought into view. Whether it had been injured in the process of dislodging the growth could not be told. The upper rim of the cavity, bounded by the separated nerves and chiasm, measured about 2 cm. in diameter. The field of operation was filled with Ringer's solution; the flap was replaced and closed as usual, without drainage.

The pathologic diagnosis of "dural endothelioma" was made at the time, the lesion being a typical nonpsammomatous meningioma.

Postoperative Notes.—Other than for some postoperative headache, convalescence was uneventful. Healing was perfect, with a nearly invisible scar (fig. 3). As events proved, the left optic nerve must have been contused during the tumor enucleation, and in this eye vision was reduced to light perception. In the right eye vision remained practically unchanged at 20/200, though there was a perceptible shrinkage in the temporal field defect (fig. 4). These conditions persisted at the time of his discharge on *Dec. 22, 1916.*

Subsequent Notes.—The patient reported six months later to say that there had been a slow but steady improvement in vision, so that with the aid of a glass he could read well enough to resume his professional work. Improvement continued for the next year and more, but since *October, 1918,* vision has remained about stationary. With his last report on *May 28, 1928,* were enclosed fields of vision which show practically the same defect in the right eye that was present at the time of his discharge. He has regained sufficient vision in the nasal field of the left eye to count fingers, and the acuity in the right eye has increased to 20/100ths. There certainly has been nothing to suggest recurrence of the growth.

Comment.—This was an encouraging experience when one considers the elementary state of our knowledge of these suprasellar meningiomas twelve years ago. As a matter of fact, until the growth came to be

examined histologically, it was assumed to be a fibrous adenoma. The chief importance of the case lies in the fact that nearly twelve years have elapsed without evidence of recurrence, even though some nests of viable meningocytes that had penetrated into the dural spaces must in all certainty have been left behind at the time of the enucleation.

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Soon after this encouraging procedure came a two-year period of absence from the clinic overseas, which served to dim, if not completely to obliterate from memory, many of the accumulated experiences of peace-time surgery. The lessons of this particular case were wholly forgotten when, in March, 1920, the next patient with a similar, though somewhat more advanced, syndrome came under observation. An attempt was made to expose the tumor, whose nature was not suspected, by the lateral osteoplastic method, with widely uncovered brain, which had just been warmly advocated by Dr. Heuer.[7]

CASE 2.—*Failing vision for eighteen months. Primary optic atrophy. Bitemporal hemianopsia. Beginning absorption and deformity of sella. Attempted exposure of the lesion by a lateral osteoplastic operation. Fatality from cerebral edema. Autopsy disclosing suprasellar meningioma with envelopment of carotid arteries.*

March 22, 1920: Admission of Mrs. A., a Swede by birth, 41 years of age, referred by Dr. Allen Greenwood of Boston for a presumed pituitary tumor.

History.—The patient was the mother of five children and had always enjoyed excellent health. Eighteen months before entrance to the hospital, she began to be aware of bitemporal blurring of sight with slight morning headaches. This disturbance progressed, and for three months reading vision had been lost. For two years menstruation had been irregular and scanty.

Examination.—This in all respects was completely negative apart from a bilateral primary optic atrophy and advanced bitemporal hemianopsia (fig. 5). The visual acuity was reduced on the left to 15/200 and to 20/200 on the right. There was no impairment of the olfactory sense. The basal metabolic rate was −5 per cent. There was flattening and deformity of the sella (fig. 6), with evident pressure absorption of the posterior clinoid processes.

Operation.—April 2, 1920: Under ether anesthesia, a lateral temporofrontal osteoplastic flap was reflected with immediate subtemporal decompression. On opening and reflecting the dura, an exceedingly tense brain was exposed—too tense to justify sufficient elevation to expose the chiasmal region. An attempt to puncture the ventricle having been unsuccessful, some hypertonic saline was administered intravenously. It was then possible to bring the right optic nerve into view and to see a tumor beyond it, but, owing to the intervening position of the carotid artery and its anterior cerebral branch, it was impossible to do more than to remove a few fragments of the lesion for verification.

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7. Heuer, G.: Surgical Experiences with an Intracranial Approach to Chiasmal Lesions, Arch. Surg. **1**:368-381 (Sept.) 1920.

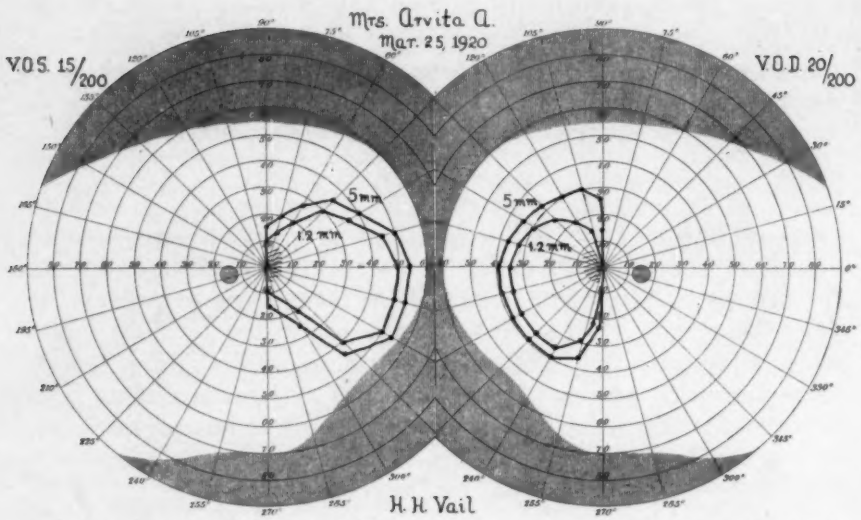

Fig. 5 (case 2).—Patient's fields on admission (perimetric method with 5 and 1.2 mm. test objects).

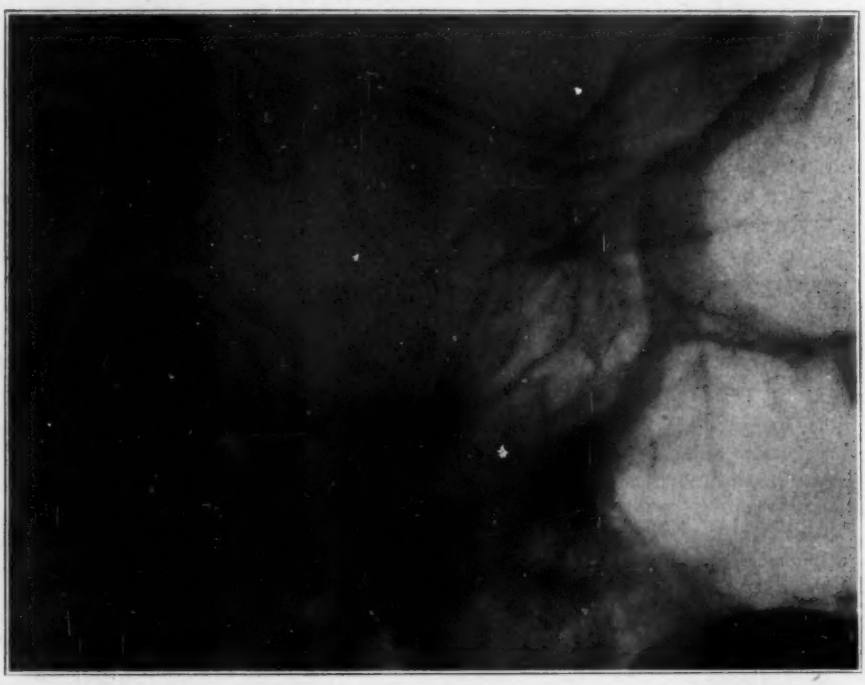

Fig. 6 (case 2).—Showing the flattened and deformed sella. Neither stereoplate shows a direct lateral view.

The procedure was an eminently unsatisfactory one, and the patient did badly afterward. There were signs of marked intracranial tension associated with left hemiparesis and Cheyne-Stokes respiration. On the chance that a postoperative clot might have formed, the flap was re-elevated on the second day disclosing merely an extremely tense frontal lobe. She died shortly afterward.

Autopsy.—The right hemisphere of the brain was found slightly contused and exceedingly swollen and edematous. Removal of the brain disclosed a nonpsammomatous suprasellar meningioma (figs. 7 and 8) as large as a horse chestnut. Its posterior portion projected downward into the pituitary fossa, causing a cup-shaped flattening of the hypophysis and accounting for the sellar deformity shown by the

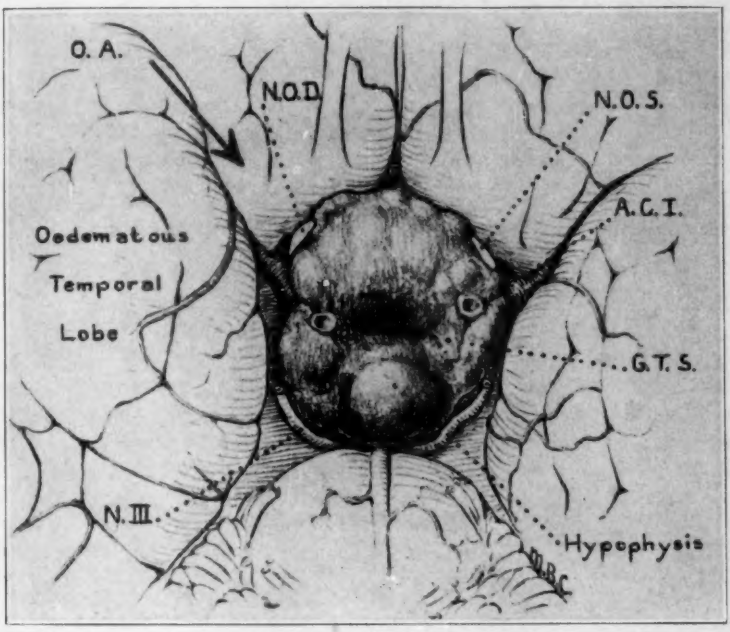

Fig. 7 (case 2).—Drawing from specimen after dissection, showing suprasellar meningioma at upper limit of removability (natural size). Fatality from postoperative edema of left temporofrontal region. Oblique arrow indicates direction of lateral operative approach; *N.O.S.*, stump of flattened nervus opticus sinistra; *N.O.D.*, nervus opticus dextra; *G.T.S.*, groove made by tuberculum sellae; *N*, III, nervus oculomotorius dextra; *A.C.I.*, arteria carotis interna.

x-rays. Both optic nerves were greatly elongated and partly embedded in the growth. The chiasm, flattened almost to paper thinness, lay over the upper surface of the growth and constituted the lower wall of the greatly dislocated third ventricle. Both carotid arteries were enveloped by the tumor, and the middle cerebral and anterior cerebral branches were so deeply embedded that the vessels could hardly have escaped injury had the enucleation been attempted. The olfactory nerves were so compressed that the clinical note of unimpaired olfactory sense may be open to doubt.

Comment.—The sella in this case had begun to show definite pressure absorption, and there were clinical evidences of secondary hypophysial symptoms. The case therefore scarcely deserves inclusion in the series, for the syndrome had gone beyond that which is strictly under consideration, and the tumor was found to have exceeded the limits of enucleability.

The record serves nevertheless to show that, in our hands at least, the lateral approach to the chiasm with widely denuded brain, according to the method that Drs. Heuer,[7] Dandy[8] and Adson[9] have advocated,

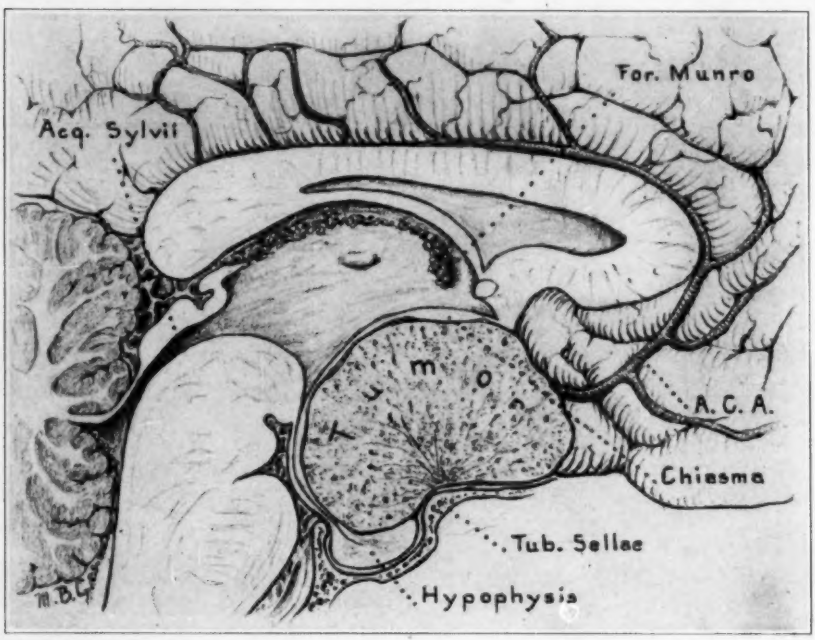

Fig. 8 (case 2).—Drawing of lesion on median sagittal section of brain, showing upward distortion of third ventricle by tumor and its overhang into pituitary fossa, with deformation of sella and compression of hypophysis. *A.C.A.*, arteria cerebralis anterior.

is actually a more formidable procedure and necessitates far greater dislocation of the brain than the perhaps technically more difficult anterior approach which permits a more direct access to the mesially placed lesion, the frontal lobe meanwhile being scarcely exposed to injury. This,

8. Dandy, W.: Prechiasmal Intracranial Tumors of the Optic Nerves, Am. J. Ophth. **5**:169-188, 1922.

9. Adson, A.: Hypophysial Tumors Through the Intradural Approach, J. A. M. A. **71**:721-726 (Aug. 31) 1918.

however, is a matter for neurosurgeons to settle among themselves and need not detain us here.

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The next case in the series can be briefly dismissed since the syndrome had advanced even further beyond the favorable stage under discussion than that just described.

CASE 3.—A woman, 66 years of age, in addition to the optic atrophy and bitemporal hemianopsia which had progressed to complete blindness in one eye and to near blindness in the other, showed impairment of olfactory sense, slight oculomotor symptoms and definite pressure absorption with distention of the sella. A pituitary adenoma was suspected. By the transfrontal route, on *Dec. 6, 1920,* a large suprasellar meningioma was exposed but only a few fragments of the tumor, sufficient to verify the diagnosis, were removed. The lesion was a typical nonpsammomatous meningioma. Though she made a good recovery from the operation, the symptoms advanced gradually to complete blindness, and she died two years later, *Aug. 14, 1922,* from the immediate effects of a fractured hip. No postmortem examination was held.

The status of the subject at about this time (1922), as expressed in the Cavendish Lecture, already referred to, is as follows:

The Suprasellar Meningiomas.—These are fairly common, the series containing eight examples. The tumors arise from the meninges covering the Willisian circle of sinuses surrounding the pituitary diaphragm. Except for the fact that they occur in adults, whereas the suprasellar tumors originating from the craniopharyngeal pouch (Rathke) usually give symptoms in childhood, the manifestations of the tumors of the two types are very similar, consisting chiefly of primary optic atrophy, of field distortions, often with hemianopsia, and finally of secondary dyspituitarism.

The growths may project upward into the region of the third ventricle and may reach an enormous size. As several of them have been unexpectedly encountered at operations conducted for presumed pituitary tumors, they have merely been verified by the removal of a small fragment of tissue and, except in one instance where a small easily dislodged tumor was found (case 1 of the present series), no attempt has been made fully to extirpate them. Consequently, except for the two cases encountered at autopsy, both of which show a remarkable similarity, the exact delimitations of the areas of attachment are somewhat conjectural.

It may be gathered from this quotation that before 1922 as many as eight tumors had been included in the series as "verified suprasellar meningiomas," all but the three cases we have just discussed having attained such a size as to make it difficult or impossible to tell what might have been their precise point of origin. The symptoms moreover had progressed far beyond the stage that evokes the syndrome with which we are at present concerned. This in a measure was true also of the next case in the series, a brief account of which follows.

CASE 4.—An Austrian laborer, 41 years of age, was transferred from the medical to the surgical service on *May 21, 1923,* in such an advanced stage of pressure symptoms that a dependable examination was impossible. It was

learned that for eighteen months he had been complaining of headaches, vertigo, vomiting and loss of vision, and had shown marked mental impairment. There was bilateral spasticity with ankle clonus and dorsal toe-response. The right optic nerve showed the atrophic pallor of primary atrophy with a suggestion of superimposed edema; there was an anomalous condition of the retina, where there was a large patch of nonmedullated nerve fibers. The cranial x-ray film showed evidences of general pressure in which the sella participated.

Under saline administration the patient rallied sufficiently for us to make out on rough tests that the left eye was blind and that there was a suggestive temporal

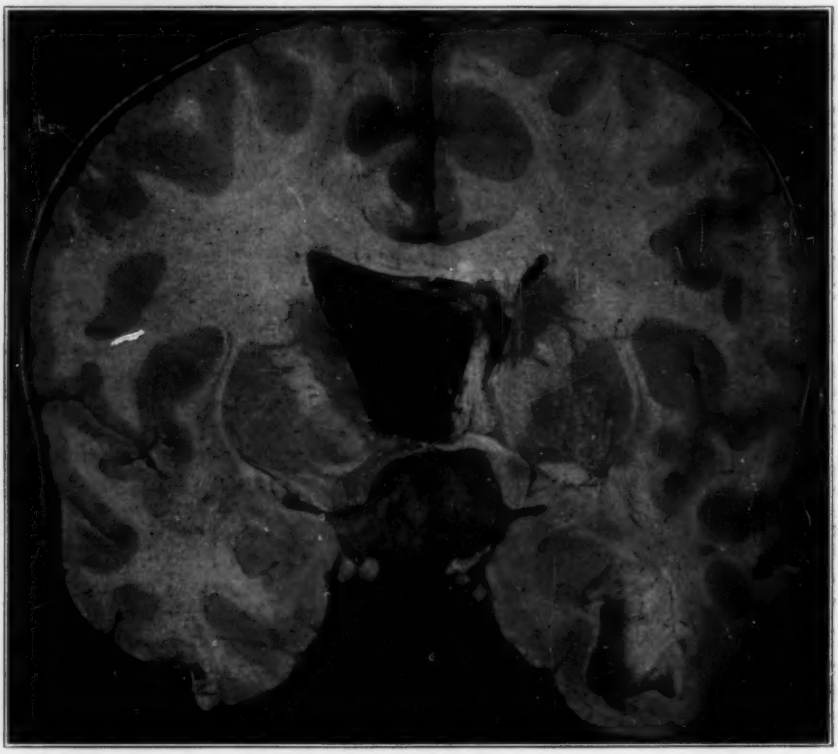

Fig. 9 (case 4).—Coronal section of the brain, showing a suprasellar meningioma which had reached a size sufficient to cause hydrocephalus (unilateral in this case). Death followed ventriculography.

hemianopsia on the right. He was thought by one observer to show a left hemihypesthesia. He soon lapsed again into a stuporous condition, and as a localizing diagnosis was impossible, recourse was had to ventriculography. The film showed an enormously dilated left ventricle with a complete filling defect of the third ventricle. The patient shortly after passed into coma and died.

A postmortem examination disclosed a suprasellar meningioma in which the carotid arteries and optic nerves were deeply embedded and which projected upward into the third ventricle to the point of occluding the left foramen of Munro (fig. 9). The growth showed a few psammoma granules.

This discouraging experience was followed four months later by one still more so, since, at the conclusion of what promised to be an even more favorable operation than that recorded in case 1, there occurred one of those sudden and shocking tragedies which serve to unnerve a conscientious surgeon.

CASE 5.—*Progressive loss of vision for fifteen months. Primary optic atrophy. Bitemporal hemianopsia. Normal sella. Transfrontal operation. Total extirpation of tumor. Injury of ophthalmic artery at last moment. Fatal hemorrhage. Autopsy.*

Sept. 13, 1923: Admission of W. B., a storekeeper, 57 years of age, complaining of increasing dimness of vision; referred by Dr. Henry B. Stevens of Boston for diagnosis.

History.—For a number of years the patient, a man of exemplary habits and uniformly good health, had complained of some headache and a sense of ocular fatigue. These symptoms subsided after glasses were prescribed. In *June* of *1922,* he began to notice blurring of vision, and a small central scotoma was detected in his left eye. He was given syrup of hydriodic acid and advised to rest. A month later, the other eye became similarly affected. He was supposed to have a retrobulbar neuritis and went through the usual program of seeing many specialists—neurologists, ophthalmologists, roentgenologists, rhinologists, dentists, etc., during the course of the next year.

An ophthalmologist advised an operation on the ethmoid and sphenoid sinuses, which accordingly was performed in *September, 1922;* no suppuration was found, but the bone was said to have been abnormal. By *June 28, 1923,* a tendency toward a bitemporal hemianopsia was noted, but it was not until *September 7th* that definite pallor of the nerves was first observed. By that time he had lost all color sense except a small, irregular patch of red in the nasal fields.

Examination.—This was wholly negative except for the condition of the eyes, in each of which there was an unmistakable though not extreme primary atrophy. The fields of vision (fig. 10) showed a bitemporal defect more advanced on the left where the papillo-macular fibers were involved, causing greatly reduced vision (left eye, 10/200; right eye, 20/70). The sella was normal (fig. 11). There was no impairment of the olfactory sense. There were no evidences of secondary pituitary involvement; the basal metabolic rate was −11 per cent.

The preoperative diagnosis at the time lay between a suprasellar (Rathke's pouch) cyst and a primary glioma of the chiasm.

Operation.—Sept. 20, 1923: In the course of the usual right osteoplastic transfrontal procedure which was conducted without incident under ether anesthesia, the dura just above the sphenoidal ridge was incised, and the anterior margin of an unmistakable median meningioma was exposed. The nerves which were widely separated lay in view and the anterior part of the tumor was excavated fragment by fragment with the pituitary rongeurs until the portion of the growth over the tuberculum was removed. Bleeding was slight in amount and easily controlled by the temporary placement of bits of muscle. It was finally possible to tilt forward the remaining posterior shell of the tumor from under the chiasm in one or two large pieces. The bed from which the tumor had been removed appe red to be entirely clean, and the previously flattened nerves had begun to resume their normal rounded form.

On scrutinizing the field before closure, there was detected what was taken to be a small shred of tumor just at the point of exit of the left optic nerve into its

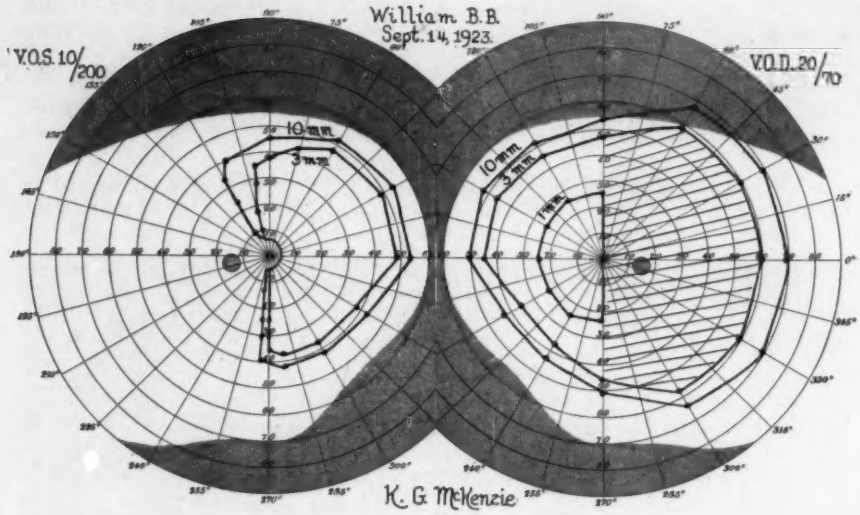

Fig. 10 (case 5).—Fields of vision on admission (perimetric method with 10, 3 and 1 mm. test objects). Shaded area hazy to 3 mm. disk.

Fig. 11 (case 5).—Showing profile of sella to be in normal limits.

foramen (fig. 12). This bit of tissue unfortunately overlay the ophthalmic artery, and in dislodging it, the artery must actually have been torn away from its origin in the adjacent carotid. There was sudden profuse hemorrhage, which was temporarily controlled after an assistant had succeeded in compressing the carotid arteries in the neck. There had been such a loss of blood, however, that in spite of transfusion the patient succumbed.

Tumor Fragments.—The fragments of tumor, weighing 15.1 Gm., such as were not taken for section are shown in figure 13. Histologically, the growth was a typical nonpsammomatous meningioma.

Autopsy—The entire block, including the sella, was removed for study. The specimen (fig. 14) shows a tear into the side of the left carotid, which was stiff and atheromatous. On the right can be seen the serpentine coil of the corresponding right ophthalmic artery as it leaves the right carotid to enter the optic foramen. The nerves had been pushed so far to the side that the ophthalmic arteries,

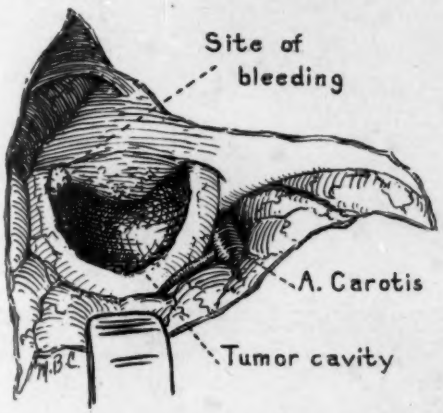

Fig. 12 (case 5).—From surgeon's sketch made immediately after operation, showing appearance of field after removal of tumor and situation of final tag of tissue, removal of which led to fatal hemorrhage.

ordinarily concealed from above, were brought into view. There were no remaining macroscopic traces of the tumor, which apparently had been wholly removed. (For further notes on this block of tissue cf. p. 64.)

Comment.—Though one's confidence may be temporarily shaken, something may be learned even from a surgical disaster. The operative findings served vividly to recall the earlier experience with case 1, in which a precisely comparable growth had been removed seven years previously. The impression that the tumor had been wholly removed without apparent injury either to the nerves or to the chiasm was sustained by the postmortem examination, which showed at least no gross evidence of any residual fragments of the lesion. Though this was an encouraging disclosure, the loss of the patient was sufficiently disheartening to lead to a more conservative attack on the next case that came under

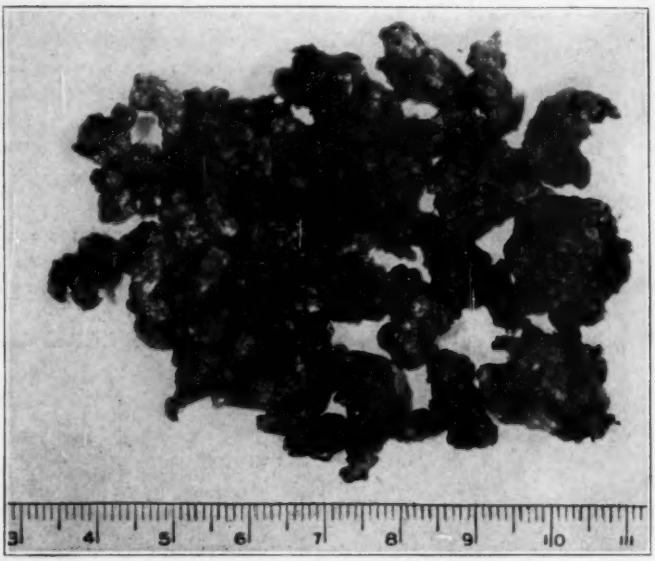

Fig. 13 (case 5).—Fragment of tumor weighing 15.1 Gm. removed at operation.

Fig. 14 (case 5).—Photograph of site of tumor, showing prominent tuberculum sellae lying between optic nerves and carotid artery. Note on left just below stump of optic nerve the black hole corresponding to point at which ophthalmic artery is missing; note presence of ophthalmic artery on right passing from carotid under nerve. The diaphragm sellae between the tuberculum and infundibular stalk is slightly blood-stained but to the naked eye quite free from tumor (cf. figs. 72 and 73).

observation a month later. The syndrome, as in cases 3 and 4, had advanced beyond that under immediate consideration, so that only a brief abstract of the story need be given.

CASE 6.—The patient, Mrs. H. K., a woman 50 years of age, had had a progressive failure of vision for twelve years. She had been wholly blind in the left eye for six years and all that remained was a restricted nasal field in the right with a residual acuity of 10/250. The nerves were highly atrophied She was having convulsive attacks, evidently uncinate in character.

The sella was slightly enlarged (fig. 15) and the presumptive diagnosis lay between a pituitary adenoma with intracranial extension and a suprasellar meningioma.

Fig. 15 (case 6).—Showing slightly distended sella with thinning of posterior clinoid process in an advanced case.

At the operation (*Oct. 11, 1923*), the nerves were found to be wholly concealed by a suprasellar meningioma with numerous psammomatous granules, and though the nerve on the right was finally laid bare and a fairly radical excavation of the tumor was made, the left nerve was never exposed. She made a good recovery from the operation, and remains in good health now five years later with the neighborhood symptoms present at the time of her admission practically unaltered.

Shortly after this unsatisfactory experience, another patient with the by now reasonably familiar syndrome in a far more favorable stage entered the clinic, and on *Jan. 25, 1924*, as will be told, a transfrontal operation was undertaken but was abandoned without even turning back the flap because of the great difficulties that were encountered. The frontal bone was exceedingly thick and vascular, and to its highly irreg-

ular inner surface a paper-thin dura was inseparately adherent. Had we possibly been at the time a little more sure of our ground, the operation might have been forced through as it successfully came to be three years later. To the history of this case we shall return in its proper sequence (cf. case 14).

* * * * * *

A year passed before the next case came under observation—one, fortunately, with a more successful operation. The patient's history shows to what procedures the victim of a suprasellar meningioma may be subjected before the true nature of the lesion comes to be verified by direct exposure.

CASE 7.—*Failing vision for seven months. Primary optic atrophy. Supposedly a right homonymous hemianopsia with practical blindness on left. Approximately normal sella. Transfrontal operation. Apparently total removal of tumor. Restoration of normal fields and acuity in right eye. No further symptoms after nearly four years.*

Sept. 21, 1924: Admission of Miss E. B., a trained nurse, 48 years of age, complaining of progressive loss of vision; referred by Drs. Foster Kennedy and John M. Wheeler of New York with the diagnosis of pituitary or chiasmal tumor.

History.—The patient had been exposed to tuberculosis while caring for a brother who had ultimately died of the disease. She subsequently, in 1902, had cervical adenitis, presumably tuberculous, and in 1904 a rectal fistula, both conditions requiring operation. Owing to a long persisting menorrhagia, she had an abdominal operation in 1911 with removal of an ovarian cyst, the uterus and appendix; there was subsequent amenorrhea. In 1912 a cystostomy was performed for a papilloma of the bladder, and in 1922, owing to a recurrence of hematuria, the lesion was treated by fulguration.

In *February, 1924,* seven months before admission, she first became aware, while reading, of some haziness of vision. She was fitted for glasses without improvement. Sight became progressively impaired, and by *July, 1924,* the visual acuity in the left eye was reduced to counting fingers and on the right to 20/200; a month later, it had fallen off on the left to light perception and on the right to 4/200. Her tonsils were subsequently removed and several teeth extracted as possible sources of infection; finally, late in *August, 1924,* the ethmoidal sinuses were opened "to remove pressure from the optic nerves," but without checking the process. There followed a long course of treatment with thyroid extract. She finally came under Dr. Kennedy's care at the Neurological Institute in New York, when a tumor of, or in the region of, the chiasm was recognized.

Examination.—This showed a fairly well nourished woman with scars of numerous former operations, who was depressed and worried by the threat of total loss of vision. She had a bilateral primary optic atrophy with extreme pallor, particularly of the left nerve. Her visual acuity was reduced to the bare perception of light on the left and was estimated at 1/200 on the right, where she was unable to count fingers. The fields (fig. 16) were difficult to plot, but a temporal hemianopsia was demonstrable to large test objects in the right eye. The retained light perception in the left eye appeared to be in the temporal field, suggesting the residual of a right homonymous hemianopsia in conformity with the observation

of several of our predecessors.[10] The sella (fig. 17) was essentially normal, though the anterior clinoids appeared stereoscopically to be slightly sharpened. The olfactory sense had been impaired since the operation on the ethmoid cells. There were no secondary hypophysial or hypothalamic symptoms. The basal metabolic rate was normal: she had lost rather than gained weight; the amenorrhoea was definitely postoperative.

Diagnosis.—Though the unquestioned primary atrophy served to place the lesion in the region of the chiasm, there were nevertheless sources of confusion, not only from a localizing, but from a pathologic, standpoint. The apparent right homonymous field defect, could it be relied on, suggested a primary lesion to the left of the chiasm, but there were no roentgenologic evidences of this nor any history of diplopia.

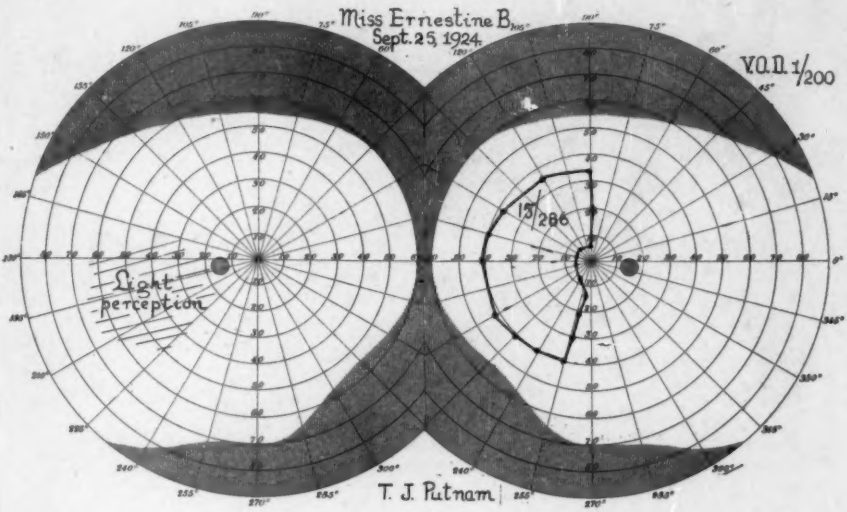

Fig. 16 (case 7).—Fields of vision on patient's admission (perimetric method with 15 mm. test object).

A tuberculoma or a metastatic tumor was possible in view of her history, but both were improbable lesions. A primary glioma of the chiasm had been suggested, and though the optic foramina had been shown in x-ray films to be of normal configuration, this was the favored diagnosis. A suprasellar meningioma was seriously considered but discarded on the grounds of the presumptive homonymous type of the hemianopsia.

Operation.—Sept. 26, 1924: Under ether anesthesia the usual right frontal osteoplastic flap was turned back without incident, and on incising the dura

10. Dr. Harry M. Weed of Buffalo has recently forwarded a copy of her visual field taken *April 28, 1924,* which shows a bitemporal involvement which at that time was more advanced in the right than in the left eye. Why the residual light perception in the left eye should subsequently have been found in the temporal field is not easily explained.

along the sphenoidal ridge, the anterior margin of a typical meningioma was disclosed underlying the chiasm and separating the optic nerves. It was finally possible piecemeal to remove the anterior part of the firm and comparatively nonvascular growth from its attachment over the tuberculum, and finally by inserting a hook into the posterior part of the growth (fig. 18) it was tilted out from under the chiasm cleanly in one piece (fig. 19). Fortunately, no vessels were injured in the process, and there was surprisingly little bleeding at any time. So far as could be seen, the extirpation was complete. The flap was replaced, and the wound closed in the usual detail.

The tumor histologically was a typical nonpsammomatous meningioma.

Fig. 17 (case 7).—Showing the essentially normal sella.

Postoperative Notes.—She made an excellent recovery from the four-and-a-half-hour operation, and so soon as consciousness was fully regained she was subjectively aware of improvement in sight in the right eye. By *October 6th,* ten days later, though the left eye remained blind, the acuity in the right, which had been practically nil before the operation, had increased to 20/40, with restoration of a vertical division between blind and seeing fields (fig. 20). Healing was perfect (fig. 21), and she was discharged on *October 14th.*

Subsequent Notes.—The patient was soon able to resume her former occupation. She meanwhile kept in touch with Dr. H. M. Weed of Buffalo, who reported constant improvement in the right eye, so that by *Nov. 10, 1925,* it had become in all respects normal, with 20/20 vision and with temporal expansion of the fields for form and color.

The patient reported in person for examination on *Aug. 28, 1928.* She described herself as in perfect general health. The left eye remained wholly blind and showed marked atrophy. The nerve head in the right eye was of fairly good color; the acuity in this eye was 20/20 and the fields (fig. 22), in comparison with those taken at the time of her discharge, showed to the perimeter fairly wide temporal peripheries. By the screen method the hemianopsia was still evident, though the function in the macular fibers, which were wholly blind before the

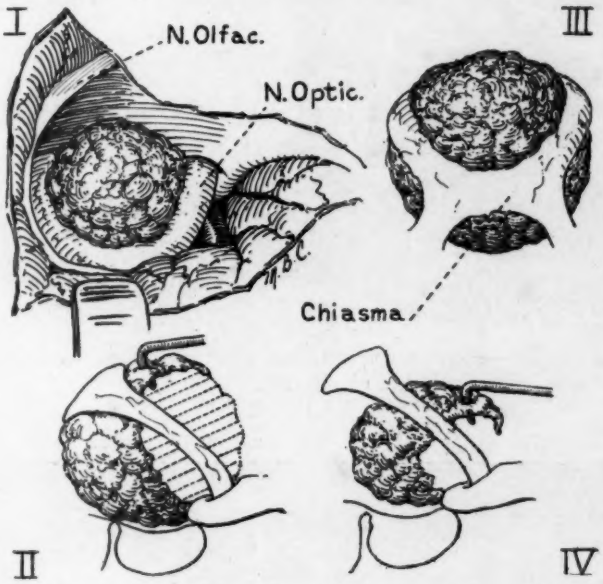

Fig. 18 (case 7).—Drawings made from surgeon's immediate postoperative sketches, showing: *I*, the lesion when fully exposed; *III*, its presumed relation to chiasm; *II* and *IV*, the final dislodgment of the tumor's posterior portion.

Fig. 19 (case 7).—Final fragment of tumor removed from under chiasm, remainder of tissue not preserved.

operation, had been restored. She was conscious also of the fact that when the eye was fatigued, there would be some haziness in the temporal field, of which at other times she was unconscious.

Comment.—This case was the first in the series in which there was a notable postoperative improvement in vision, and from an ophthal-

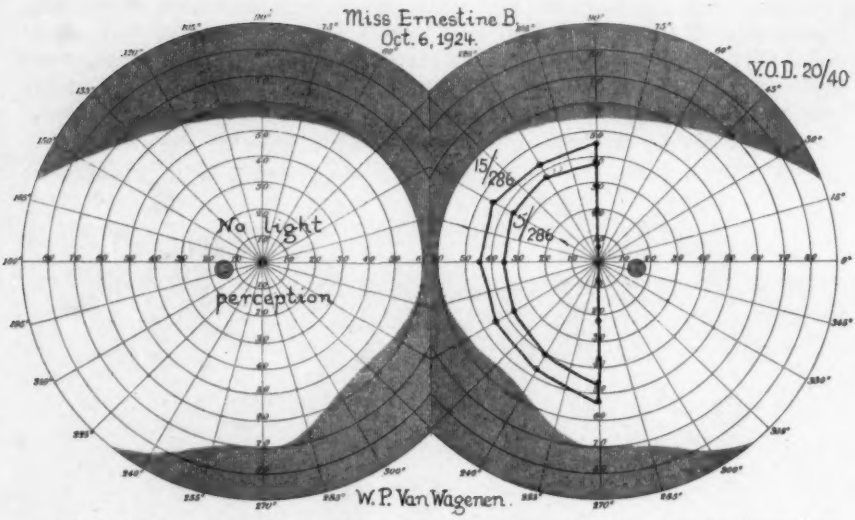

Fig. 20 (case 7).—Fields taken ten days after operation, showing immediate improvement (perimetric method: cf. fig. 16).

Fig. 21 (case 7).—*A*, patient on Oct. 6, 1924, ten days after operation, showing situation of incision and some persisting subcutaneous ecchymoses in outer temporal region; *B*, patient on Aug. 28, 1928, after four years.

mologic standpoint, it is informing in two respects. In the first place, it shows that the elongated and flattened nerves suffer more permanent damage than does the chiasm itself, for otherwise it is inconceivable that one eye should remain blind and temporal vision in the other become almost wholly restored. It shows, in the second place, that an optic nerve with primary atrophy due to pressure and with vision reduced to little more than nasal light perception is nevertheless capable of restoration of function. Such a functional recovery after a comparable degree of secondary atrophy would hardly be possible. Evidently a physiologic "block" to the transmission of impulses in an optic nerve may be pro-

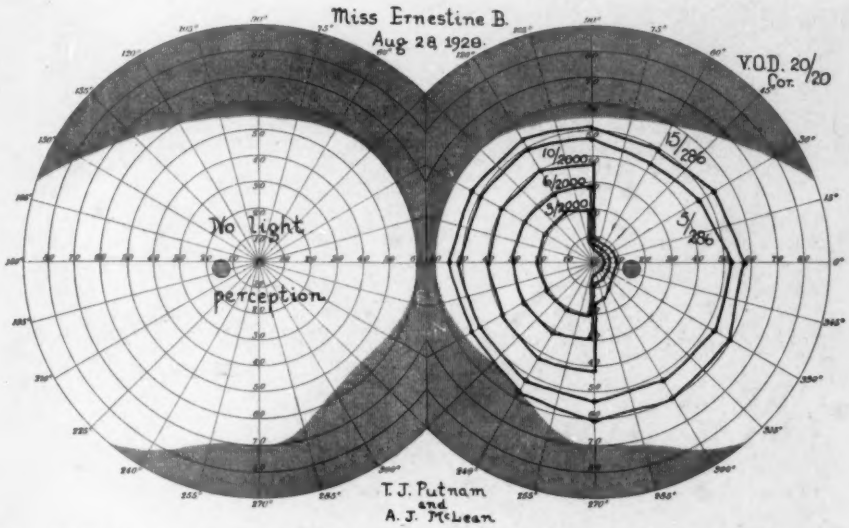

Fig. 22 (case 7).—Patient's fields four years after operation (perimetric and screen methods), for comparison with figures 16 and 20.

duced by pressure and may lead to an atrophic pallor without anatomic destruction of the conducting fibers.

* * * * * *

In the next case, which came to operation three months later, a correct preoperative diagnosis was made, though it was recognized that the growth had advanced beyond a stage favorable for removal with restoration of vision. The operation unfortunately had to be abandoned short of complete extirpation of the lesion owing to difficulties from bleeding presumably due to embedding of the anterior cerebral branch of the carotid in the growth.

CASE 8.—*Failing vision for four years.' Primary optic atrophy with unilateral blindness. Normal sella. Suggestive signs of beginning hydrocephalus. Correct*

preoperative diagnosis. Subtotal extirpation of tumor resulting in further impairment of vision. No evidence of recurrence after three years.

Jan. 29, 1925: Admission of Mrs. D., 57 years of age, referred by Dr. W. B. Lancaster of Boston for an opinion concerning her ophthalmologic symptoms.

History.—Aside from an operation for uterine fibroids in 1917, which had left her with a ventral hernia, she had enjoyed for the most part uninterrupted good health. In *March, 1920,* she first noticed blurring of vision which began in the left eye and soon involved the right, associated with dull discomforts in the eyes following prolonged use.

She was given osteopathic treatment for six months. Meanwhile vision became progressively worse, and by 1923 the left eye had become almost completely blind. In 1924, the right eye had become so impaired that she was no longer able to read. She was given vigorous antisyphilitic treatment without benefit. She had recently

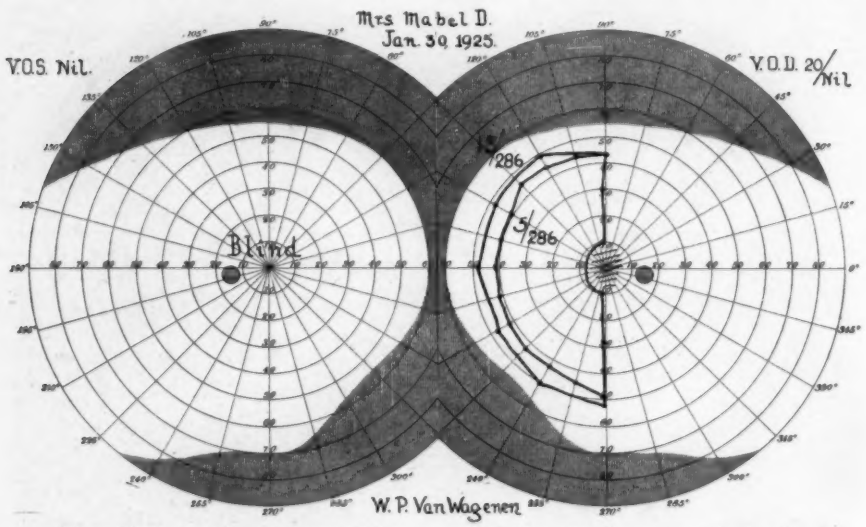

Fig. 23 (case 8).—Patient's fields on admission (perimetric method with 15 and 5 mm. test objects).

had some frontal headaches with nausea ascribed to biliousness. She had also noticed some unsteadiness of gait, which was attributed to her impaired sight. There had been a tendency of the right eyelid to droop.

Examination.—The patient was a stout, middle-aged woman, who exhibited evidences of mental impairment. There was a bilateral primary atrophy, the disk margins showing slight superimposed haziness. The left eye was practically blind, but the right eye showed (fig. 23) a temporal hemianopsia with acuity reduced to 2/70 with zero vision at 20 feet. The olfactory sense was below normal. The sella (fig. 24), though of normal size, had begun to show indications of pressure absorption, but there were no discernible secondary hypophysial symptoms; the basal metabolic rate was + 2 per cent.

In addition to the ophthalmologic findings, she had considerable vascular hypertension (systolic pressure, 180; diastolic, 100), emphysema of the lungs, varicose veins of the legs, and the deep reflexes were considerably exaggerated with suggestive clonus.

A presumptive *diagnosis* of an advanced suprasellar meningioma was made, and an exploratory operation was advised with some hesitation.

Operation.—Feb. 12, 1925: Under ether anesthesia, by the usual transfrontal method of exposure, a median suprasellar meningioma was disclosed of about the size encountered in case 2. Though the growth was centrally placed, it so completely overlapped the nerves and chiasm (fig. 25) that the embedded right optic nerve was identified only after prolonged piecemeal removal of bits of the tough tumor. Finally, in the effort to uncover the chiasm, a sharp hemorrhage was produced, probably from the anterior cerebral artery which had cut its way into or become enveloped in the growth; the bleeding was finally controlled with difficulty. A complete extirpation was obviously impossible, and further attempts in this direction were abandoned. The wound was closed.

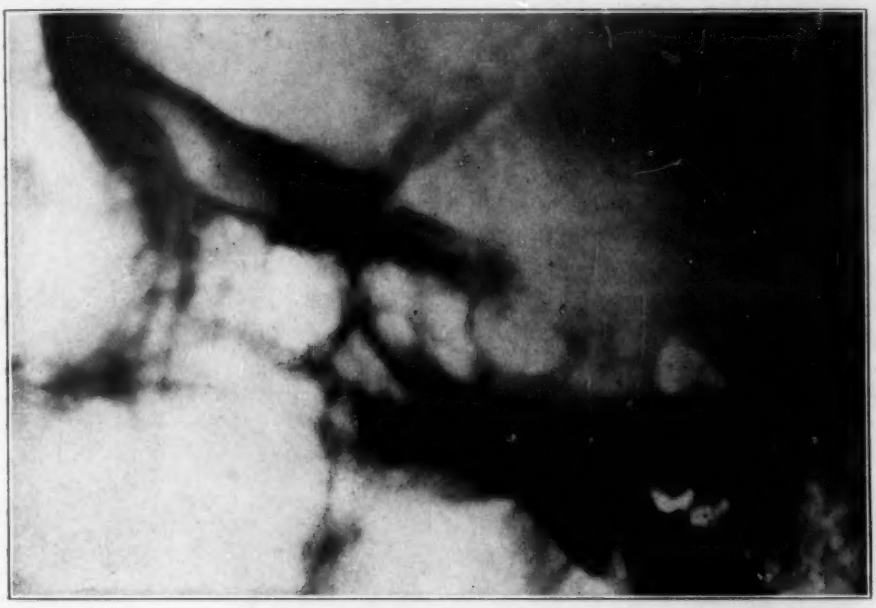

Fig. 24 (case 8).—The sella, though of normal size, shows evidences of some pressure absorption.

Postoperative Notes.—She made an excellent surgical recovery (fig. 26) but the already seriously damaged right optic nerve, doubtless owing to the contusion to which it had been subjected, showed further constriction of the nasal field. She was discharged on *March 5, 1925.*

Pathologic Note.—The fragments of the tumor weighed 9.5 Gm., probably representing less than half of the growth. The lesion was a meningioma with rare psammoma granules.

Subsequent Notes.—The patient has reported at regular intervals, and for three years has kept in reasonably good health, but her vision has progressively failed. When last examined, *Jan. 22, 1928,* it had become reduced to mere light perception and to the recognition of moving objects. She has taken up the study of braille and occupies herself with knitting and music.

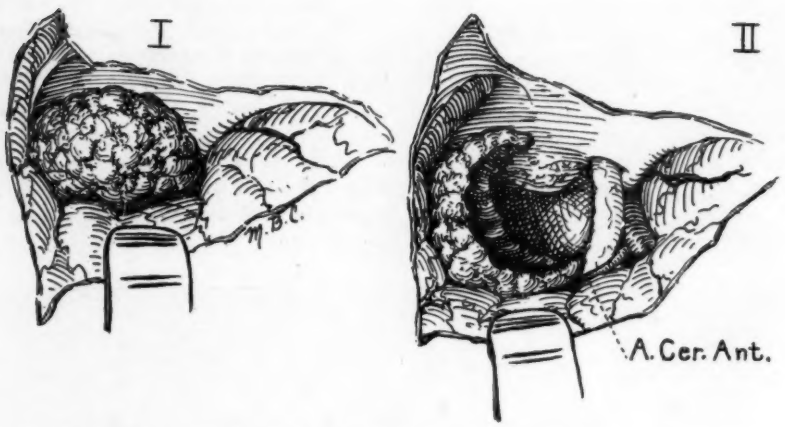

Fig. 25 (case 8).—Drawings made from surgeon's immediate operative sketches, showing: *I*, the appearance when the lesion hiding both nerves was first exposed; *II*, the extent of the enucleation when the procedure was abandoned.

Fig. 26 (case 8).—Patient shortly before her discharge, showing the practically invisible traces of the operation.

Comment.—The operation in this case may have served to forestall the threat of an internal hydrocephalus. Other than in this respect, it accomplished nothing, and indeed actually accelerated the loss of vision it was undertaken to prevent. The attempt wholly to remove a meningioma of this size in which the nerves have become embedded, with any reasonable expectation of preservation of vision, is possibly a nigh hopeless venture. A study of the autopsy specimen provided by case 2 (cf. figs. 7 and 8) would lend support to this view.

Fortunately we have not been obliged to put the matter again to the test, for none of the tumors in the remaining seven cases in the series have passed beyond the symptomatic stage which is the primary object of this paper to emphasize.

* * * * * *

We had by this time learned enough about the lesion in question to make us more confident of our ability to deal with it under circumstances that were reasonably favorable. The tumor in the following case as in cases 1, 5 and 7, was successfully removed though with a less brilliant result on the score of immediate improvement in vision than was secured in case 7.

CASE 9.—*Failing vision for fourteen months. Bilateral optic atrophy. Bitemporal hemianopsia, having progressed to practical blindness in the right eye. Approximately normal sella. Correct preoperative diagnosis. Transfrontal operation with apparently total removal of tumor. Restoration of normal acuity on left with partial return of temporal vision. No evidence of recurrence after three years.*

May 8, 1925: Admission of Mr. A. W. B., aged 33, a newspaper reporter, complaining of failing vision, referred by Dr. C. E. Hill of Toronto with the diagnosis of tumor involving the chiasm.

History.—In *March, 1924,* the patient, who had always enjoyed perfect health, first noticed blurring of vision for distant objects, particularly in the temporal side of the right eye. A month later, the same process began in the left eye, though it was slower in progress. In *June,* he was given correcting glasses. By *September,* he had lost reading vision in the right eye, and at this juncture a rhinologist explored the right ethmoid cells, and the patient was told that a cystic condition was found which pressed on the optic nerve. At the same sitting, his tonsils were removed. A few weeks later, there was a sudden and unaccountable improvement of vision in the right eye, and the left eye became the most defective for reading. This condition during *November* became again reversed, and at the time of admission he could barely perceive the movement of large objects in the right eye. Before the sight of this eye had become so greatly impaired, he was conscious of slight diplopia.

Physical Examination.—Apart from the ophthalmologic findings, the examination was negative in all respects. There was a bilateral primary optic atrophy, more advanced on the right. The fields of vision (fig. 27) showed an incomplete temporal hemianopsia on the left with about 20/30 acuity, whereas on the right there was faint perception of light and of large moving objects on the nasal field. The olfactory sense was unimpaired. The sella turcica (fig. 28), though shallow,

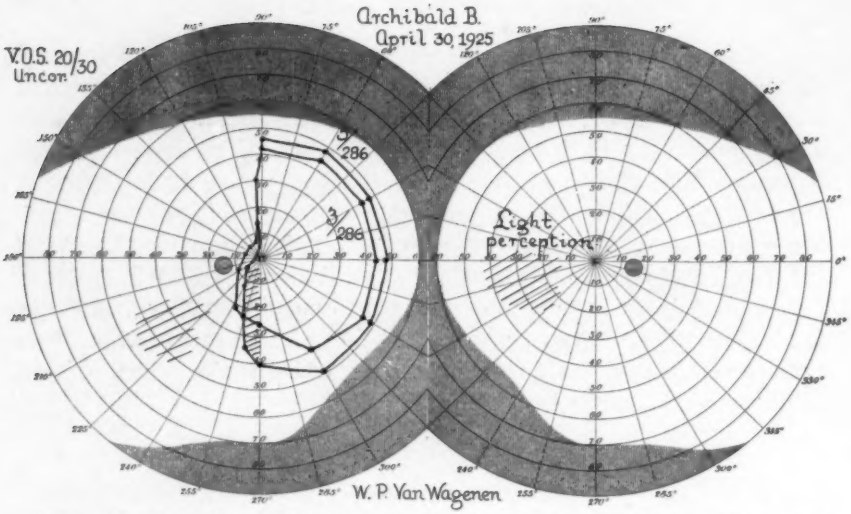

Fig. 27 (case 9).—Fields of vision on admission (perimetric method with 5 and 3 mm. disks).

Fig. 28 (case 9).—Showing (in slightly oblique view) small thin-walled sella, stereoscopically normal in outline.

showed no erosion or deformity apart from an apparent forward bending of the posterior clinoids. There were no secondary hypophysial symptoms; the basal metabolic rate was −7 per cent.

The presumptive *diagnosis* of a suprasellar meningioma in a favorable early stage was made.

Fig. 29 (case 9).—Anterior (excavated) and posterior surfaces of the large fragment, the last to be removed.

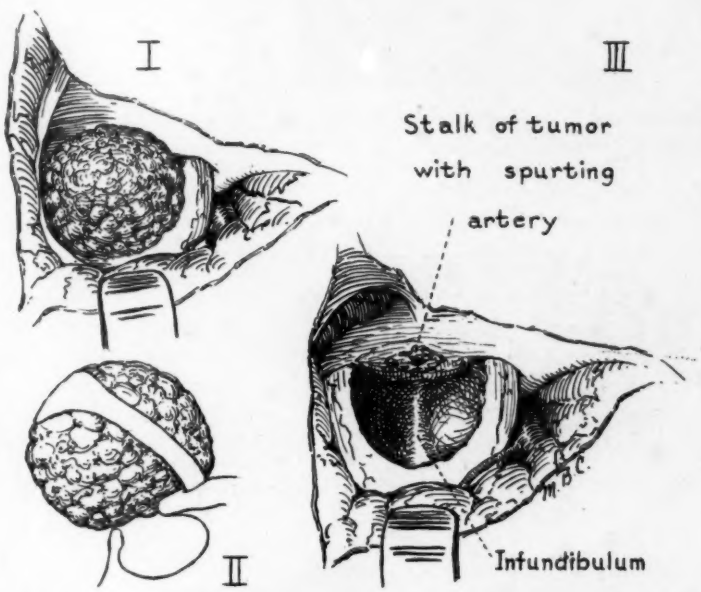

Fig. 30 (case 9).—Drawings from sketches at time of operation, showing: *I*, the early view of the tumor; *II*, its estimated relation to the chiasm; *III*, the appearance of the cavity after the enucleation with the elongated infundibular process, showing at its base.

Operation.—May 9, 1925: As on previous occasions, the anterior portion of the tumor lying between the nerves was removed by the pituitary rongeurs, considerable bleeding being set up so soon as the tuberculum sellae was laid bare. This bleeding came from a spurting dural arteriole which caused trouble until it was checked by

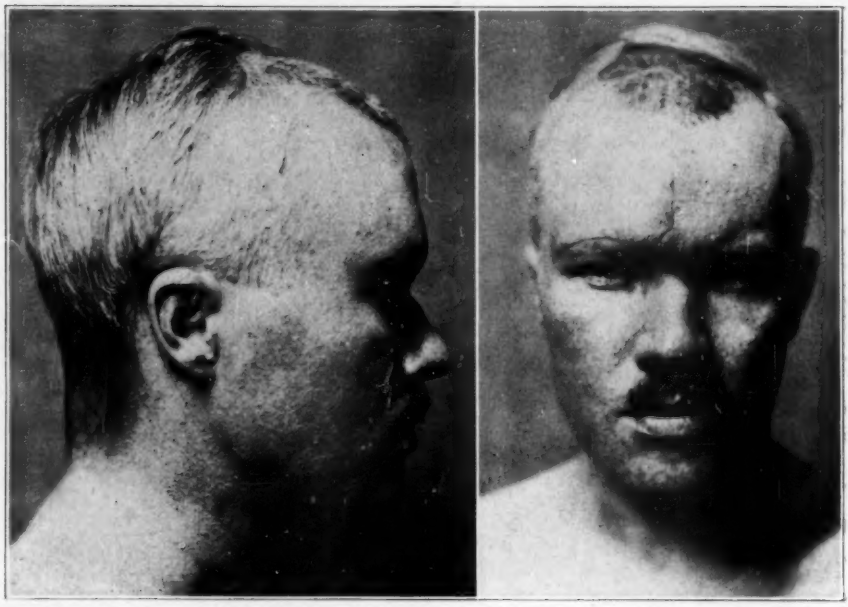

Fig. 31 (case 9).—Patient on sixteenth day after operation, showing position and state of incision.

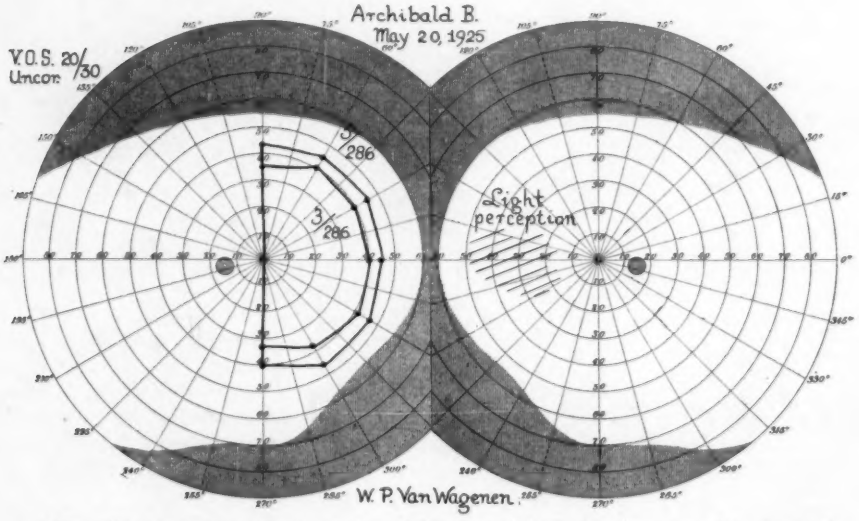

Fig. 32 (case 9).—Postoperative fields of vision, showing complete loss of temporal vision, but with acuity retained (for comparison with fig. 27).

the placement of a bit of muscle. It was then possible to continue with the excavation of the growth until finally the large posterior fragment (fig. 29) was cleanly tilted forward and dislodged from under the chiasm without bleeding and apparently without injury to the flattened nerves.

This procedure left a smooth cup of surprising depth and size on the surface of which could be seen the elongated and flattened stalk of the hypophysis passing into the infundibulum (fig. 30). The operation was easier than any of the preceding ones, and was completed in three hours.

The Tissues.—The large posterior fragment, possibly representing a third of the tumor, weighed 5 Gm. Histologically, it was a typical nonpsammomatous meningioma.

Postoperative Notes.—Recovery was uneventful; healing perfect (fig. 31), the skin sutures having been removed in forty-eight hours. There was no postoperative improvement in vision up to the time of the patient's discharge on *May 26, 1925;* indeed, the fleeting perception of moving objects in patches of the left lower temporal field, present before the operation, had been lost (fig. 32).

Subsequent Notes.—The patient was not heard from for two years, when he answered a letter of inquiry to say that he had been in perfect health and was actively engaged in editorial writing. His right eye had improved somewhat, but was of little or no use for reading. The left eye, on the other hand, had improved markedly, with sufficient return of sight in the formerly blind temporal fields so that he was able to count fingers and detect motion. He chiefly uses for his work the nasal field, in which he had normal acuity. A recent report of *Aug. 9, 1928,* from Dr. Hill states: that the right nerve shows marked atrophy, but in this eye the patient has regained perception of movement; that the left nerve has a normal appearance with an acuity of 6/6 and a full nasal field with perception of movement in the temporal field.

Comment.—This was the only case in the series, except case 3, in which any oculomotor symptoms were recorded, though reference to the sketch in figure 8 will show how closely adjacent is the third nerve to the side of the lesion. A comparison of figures 27 and 32 makes clear that in the dislodgment of the tumor the mesial edge of the left optic nerve had been traumatized, with further damage to the seriously impaired crossed-fiber bundle. Fortunately the intact uncrossed fibers escaped injury; and there has evidently been a partial return of function in areas temporarily blinded by the operative contusion.

* * * * * *

The next case was out of the ordinary in that a flocculent calcification in the lesion was disclosed by the x-ray, which led to an erroneous diagnosis. There, moreover, was difficulty in dislodging the posterior shell of the partly excavated growth, and in so doing the elongated hypophysial stalk and flattened thalamic portion of the third ventricle must have been traumatized, for there was a temporary postoperative polyuria.

CASE 10.—*Failing vision for three years beginning in left eye. Primary optic atrophy on left with beginning pallor on right. Bitemporal field defects. Normal*

sella with shadows of suprasellar calcification suggesting craniopharyngeal-pouch cyst. Disclosure and removal of suprasellar meningioma. Postoperative polyuria and polydipsia. Left eye blinded; restoration of normal fields and acuity on right. No evidence of recurrence after three years.

July 8, 1925: Admission of Mrs. Adele J., a trained nurse, 28 years of age, referred by Dr. E. L. Meierhof of New York with the complaint of failing vision.

History.—The patient had always had good health.. She had been married ten years, and had a daughter 8 years of age. In 1922, she was hit at the base of the nose by a delirious patient, and a few weeks later noticed blurring of vision in the left eye. This condition persisted practically unaltered for the next three years. As it did not interfere with her work, it was ignored until five weeks before admission to the hospital, when, shortly after the only severe headache she had ever recalled, she found, while reading, that vision had suddenly become blurred in the

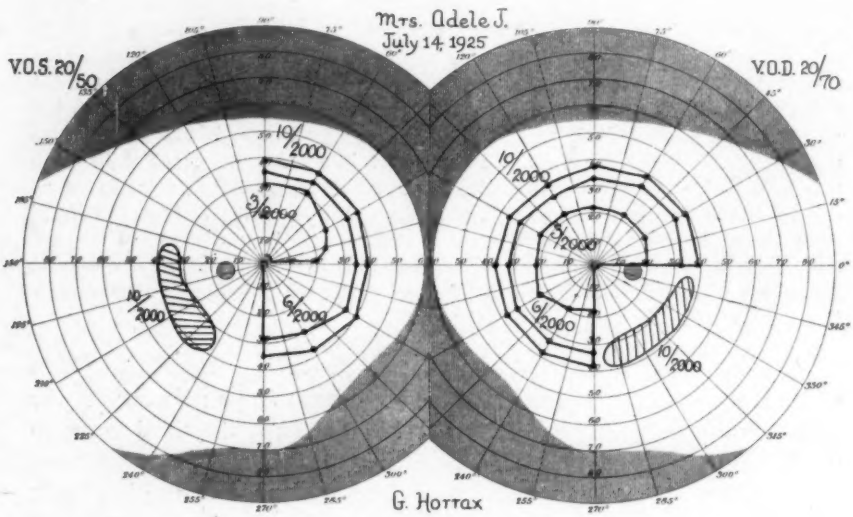

Fig. 33 (case 10).—Patient's fields on admission (screen method with 10, 6 and 3 mm. disks), showing bizarre bitemporal defects.

right eye. For this she consulted Dr. Meierhof, who promptly referred her to the Brigham Hospital.

Examination.—The patient was a healthy and well nourished Jewess, with normal physical findings and no complaints other than impairment of sight. The optic nerves showed extreme pallor on the left and early atrophy on the right. The fields taken on the screen showed (fig. 33) bitemporally disposed but curiously asymmetrical defects indicating impairment of the upper half only of the crossed bundle to the right eye, whereas on the left the upper half of the uncrossed bundle was all that remained functionally intact. Both macular bundles were impaired. At times central vision was so reduced she was unable to count fingers at a distance greater than 18 inches, though the recorded acuity on the day the fields happened to be taken was 20/50 left and 20/70 right. The pupillary light reactions were sluggish. There was no disturbance of olfactory sense. The sella (fig. 34) was quite normal in configuration, but there were fine flocculi of calcification show-

ing above it. There were no evident hypophysial symptoms, though the basal metabolic rate was −22 per cent.

The *diagnosis* of a craniopharyngeal-pouch cyst was made on the basis of the suprasellar calcification; it was perhaps favored also by the woman's age, which was below the average for a patient with meningioma.

Operation.—July 17, 1925: Under ether anesthesia, in the course of the usual transfrontal procedure a tumor of precisely the same appearance as those in the previous cases was disclosed (fig. 35). The growth was relatively nonvascular and was removed piecemeal (fig. 36 *A*), its central calcareous and gritty portion coming away in two or three good-sized fragments. The left optic nerve was not easily exposed, and it was finally found lying in a deep groove on the surface of the tumor which concealed it. There was greater difficulty than in the pre-

Fig. 34 (case 10).—Showing sella of normal outlines with a suprasellar flocculent shadow (within arrows) discernible stereoscopically.

ceding cases in dislodging the posterior shell of the lesion, but when it was finally lifted out, the deep, smooth-walled cavity was apparently clean. Closure was made in the usual detail.

The tumor proved histologically to be an abundantly psammomatous meningioma, such fragments as had been preserved casting shadows of calcification on an x-ray film (fig. 36 *B*).

Postoperative Notes.—Though there was perfect wound healing (fig. 37) an otherwise uneventful convalescence was marred by a temporary diabetes insipidus; this had evidently been produced by the operative trauma of the infundibular stalk which had not been seen. Moreover, the difficulties in dislodging the growth from the embedded left nerve had evidently so traumatized it that only a bare light perception was left in that eye. In the right eye, however, improvement in vision

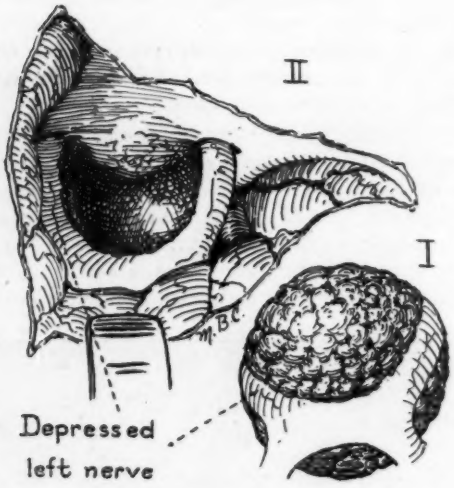

Fig. 35 (case 10).—From operative sketches in which the attempt was made to show the low-lying position of the elongated left optic nerve which was partly embedded in the lesion.

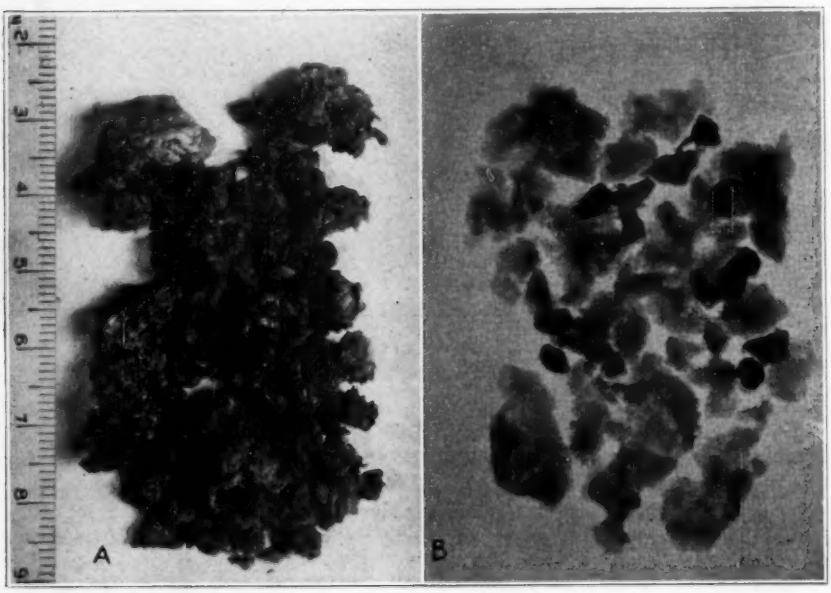

Fig. 36 (case 10).—*A*, fragments of tumor weighing only 7.7 Gm.; probably an equal amount of tissue was lost down the sucker; *B*, x-ray picture, showing granular calcification in fragments.

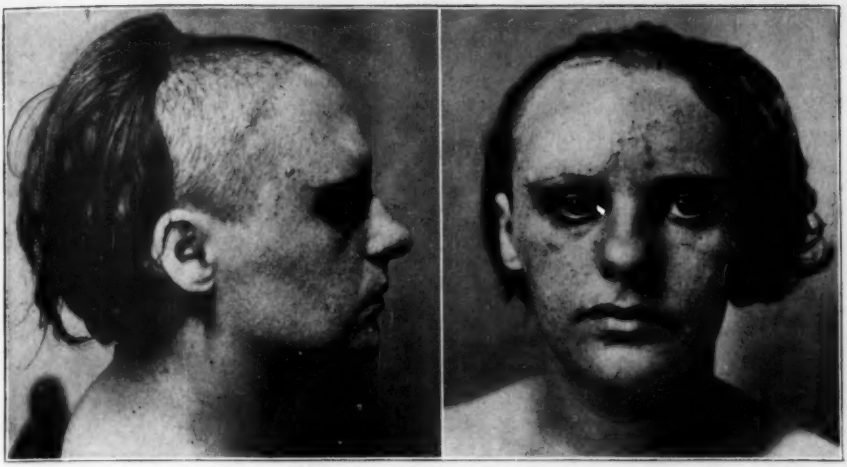

Fig. 37 (case 10).—Patient on July 30, two weeks after operation, showing inconspicuous nature of flap. Vertical incision made slightly to the side owing to the presence of acne.

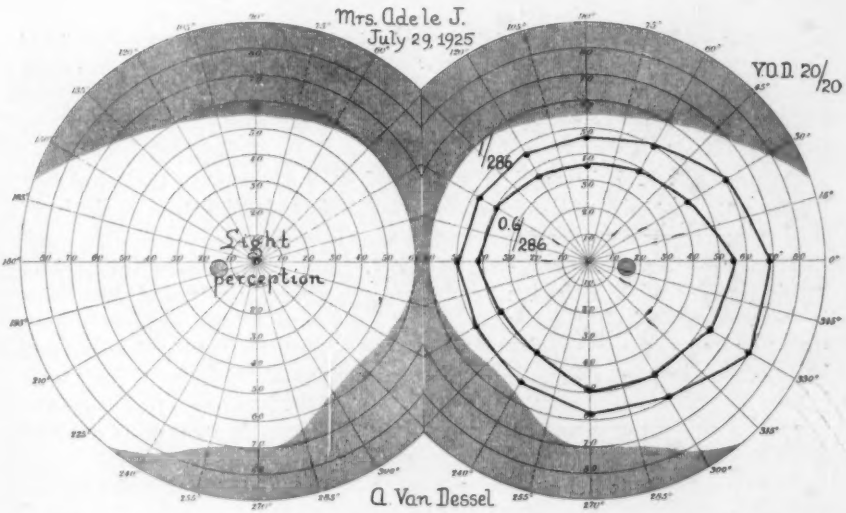

Fig. 38 (case 10).—Fields of vision twelve days after operation (perimetric method with 1 and 0.6 mm. test objects). (Cf. fig. 33).

was appreciated immediately after the operation; and when her fields came to be taken twelve days later, their peripheries to the perimeter were found to be normal (fig. 38) with 20/20 vision. She was discharged on *August 7th.*

Subsequent Notes.—She reported on *Dec. 5, 1925,* to say that she was still having a marked polyuria and polydipsia, sometimes amounting to 8 liters a day. This promptly responded to a pituitary régime and gradually subsided. A report of *Nov. 7, 1927,* stated that she was in perfect health and engaged in her professional work. We have temporarily lost track of her.

Comment.—The erroneous preoperative pathologic diagnosis in this case was due partly to her age, partly to the rather long duration of symptoms (three years), but more particularly to the presence of suprasellar calcification detected in the x-ray film. The tumor was rather large, and in its enucleation the hypothalamic region was sufficiently bruised to occasion a temporary postoperative polyuria.

* * * * * *

Mention has been made (p. 17) of an operation, in what promised to be a favorable case, that was abandoned because of the extraordinary difficulty encountered in the attempted elevation of the bone flap. Similar difficulties, which fortunately were surmounted, were met with in the following case which was the next in the series. In spite of an unusually long history and an unusually large tumor not to have produced symptoms beyond the primary syndrome under discussion, the results of the operation have been excellent.

CASE 11.—*Failing vision for eight years beginning in the left temporal field and going on to blindness. Involvement of right temporal field for only eight weeks. Primary atrophy. Normal sella. Correct preoperative diagnosis. Apparently total piecemeal extirpation of a 16 Gm. tumor. Recovery with restoration of normal conditions in the right eye.*

May 4, 1926: Admission of Mrs. J. G., 52 years of age, complaining of failing vision; referred by Drs. Elsworth S. Smith and William Engelbach of St. Louis, with the diagnosis of an extrasellar tumor.

History.—The patient, apart from her present trouble, had always had excellent health. In *1912,* when in the fourth month of a pregnancy, she noticed obscuration in the temporal field of the left eye. This persisted for four months, at which time the pregnancy was interrupted and the visual disturbance disappeared. Six years later, in *1918,* in association with some headache, a constricted temporal field in the left eye was again subjectively observed. The defect gradually advanced in association with a primary atrophy until the eye became blind; this condition has persisted to the present time in spite of all treatment.

In *1920,* or thereabouts, an artificial menopause was induced by ovarian irradiation. A few years later the frontal sinus was operated on, and subsequently several teeth were extracted in the vain hope of improving the sight of the left eye. She has latterly been under a prolonged antisyphilitic régime. While under this treatment, three or four months before admission, and in association with some return of headache, the vision in the temporal side of the right eye began to fail just as it had done eight years before on the left.

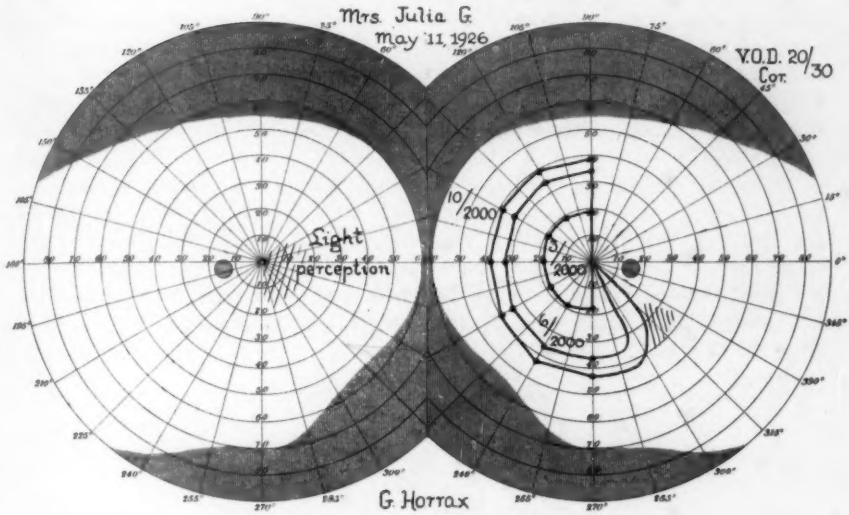

Fig. 39 (case 11).—Fields of vision on admission (screen method with 10, 6 and 3 mm. test objects).

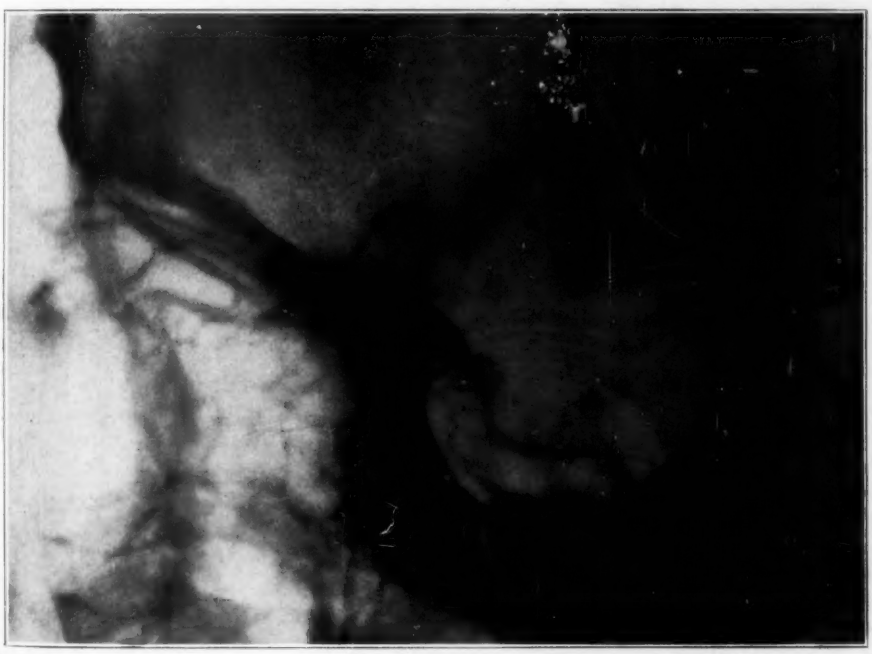

Fig. 40 (case 11).—Showing the normal sella's profile.

According to the anamnesis, the right eye during this entire period of eight years between 1918 and 1926 had remained normal, but it would appear from a series of perimetric charts which have been submitted that the color fields at least had begun to show constriction as early as *October of 1923.*

Examination.—This was negative in all respects apart from the ophthalmologic findings. There was a bilateral primary optic atrophy; the left disk was paper-white, the right one, grayish. The fields (fig. 39) showed, on the left, a small, poorly determinable patch of nasal vision, where light perception was retained; on the right, an incomplete temporal hemianopsia with the macula still partly spared and vision of 20/30 (corrected). The x-ray film (fig. 40) showed the sella to be rather shallow but without apparent erosion or shadows of suprasellar calcification; the frontal bone was thick and irregular on its inner surface. The olfactory sense was unimpaired. There were no secondary hypophysial symptoms; the basal metabolic rate was −3 per cent.

Fig. 41 (case 11).—Photograph of such fragments of tumor as were collected at operation; weight 16 Gm.

The presumptive *diagnosis* of a suprasellar meningioma was made.

Operation.—May 13, 1926: Under ether anesthesia, the usual procedure was conducted without incident other than exceptional difficulties in elevating the flap. The dura was so delicate and adherent, the guides for the Gigli saw could not be introduced; the flap had to be outlined with a Doyen saw and the bone finally broken up by a chisel. Even so, the dura was considerably frayed and torn, fortunately without injury to any corticomeningeal vessels.

The usual unmistakable tough, reddish, nodular meningioma lying between the widely separated optic nerves was exposed. The growth, which was perhaps the largest in the series to have been wholly removed, as in the other cases was primarily excavated piecemeal, until finally the remaining and unattached posterior fragments could be cleanly dislodged (fig. 41). The anterior cerebral artery overlying the chiasm (fig. 42) was in view most of the time. An unusually large cavity was left with the stretched nerves symmetrically placed on each upper

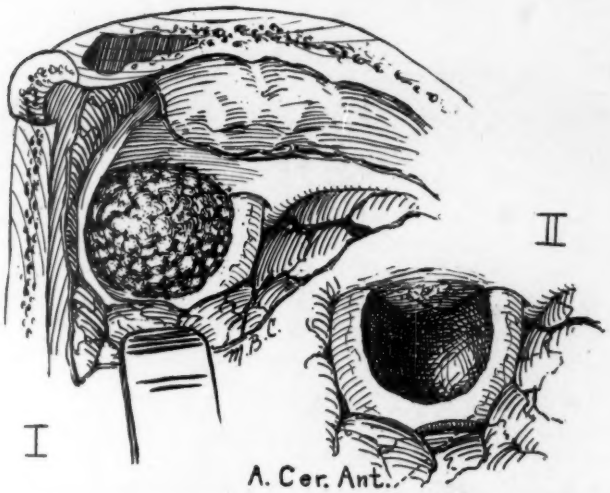

Fig. 42 (case 11).—From surgeon's sketches at time of operation, showing: *I*, the early view of the lesion before the left nerve was exposed, the olfactory nerve being in place; *II*, the empty cavity after the extirpation, with the anterior cerebral artery crossing the chiasm.

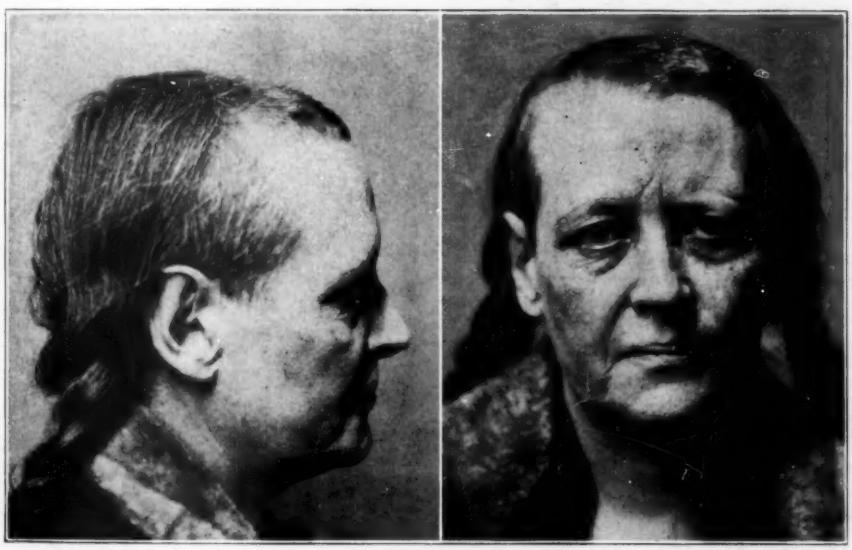

Fig. 43 (case 11).—Patient three weeks after operation, showing how few traces of it remain to be seen.

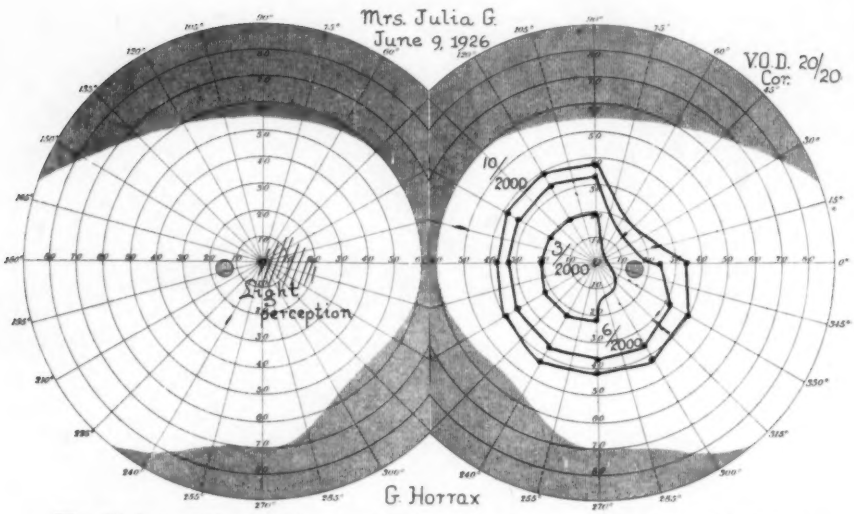

Fig. 44 (case 11).—Fields on patient's discharge, for comparison with figure 39 (screen method with 10, 6 and 3 mm. disks).

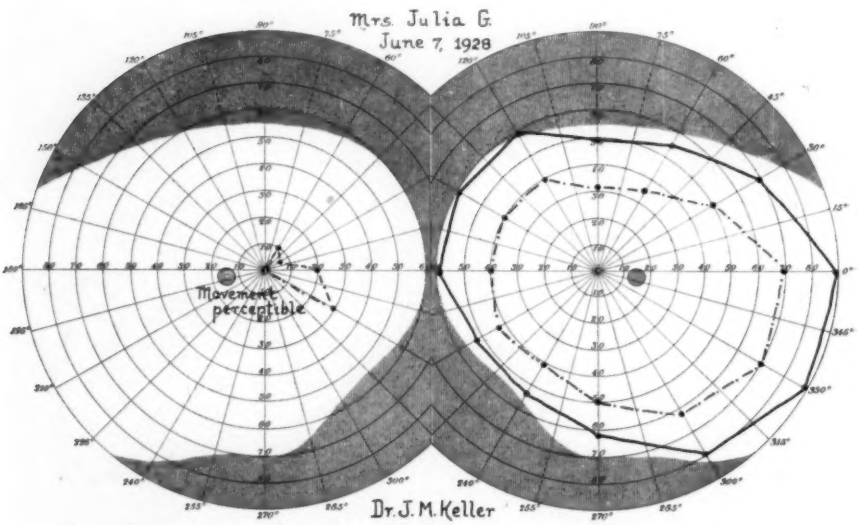

Fig. 45 (case 11).—Fields two years after operation, for comparison with figures 39 and 44 (perimetric method). Kindness of Dr. J. M. Keller.

margin. There was nothing to explain why the left nerve had been affected by the pressure more than the right.

The Tumor.—The fragments removed weighed 16 Gm.: histologically, the tumor was a meningioma with hyaline concretions.

Postoperative Notes.—The patient made an excellent recovery from the long four-hour procedure, and on return of consciousness was immediately aware of clearer vision in the right eye. Healing was perfect (fig. 43), and she was discharged on *June 10th,* by which time normal acuity had been restored in the right eye with considerable shrinkage (fig. 44) of the temporal field defect, which was improving daily. The condition of the left eye remained practically unaltered with mere light perception retained.

Subsequent Course.—In *March, 1927,* the patient wrote to say: "I am reading sometimes late into the night which I have not been able to do for two years." Dr. J. M. Keller reported at this same time to say that the condition of the right eye was in all respects normal, whereas the left was practically unchanged. A letter of *June 7, 1928,* two years after the operation, reports perfect health and continued normal peripheries for form and color in the right eye with no demonstrable scotoma (fig. 45).

Comment.—If the history of a preliminary and temporary hemianopsia in one eye with subsequent recovery for six years is to be relied on as a feature of the anamnesis, the tumor in this woman's case was of unusually long duration. The growth, which was perhaps the largest in the series to have been successfully removed, fortunately had not come to envelop the arteries. It is surprising that it has not produced hydrocephalus or secondary hypophysial symptoms.

(To be continued)

DISEASES OF THE EYE IN OLD AGE*

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Nearly a thousand years before Christ, a great poet—probably Solomon himself—spoke of age as "the day when the keepers of the house shall tremble, and the strong men shall bow themselves, and the grinders cease because they are few, and those that look out of the windows be darkened." But age is not always a question of years; for, as Sir Thomas Brown [1] wrote in 1646: "Many grow old before they arrive at age." Twenty years later, J. Smith [2] voiced the earnest desire "that Physicians would study the Geroncomical part of Physick more than they do."

Age alone is not sufficient reason for diagnosing a condition as senile. I have seen people over 90 years of age whose eyes, in many respects, were youthful; and, conversely, persons under 40 with eye lesions similar to the changes of senescence. Therefore, it is not wise to diagnose an eye lesion as senile until all toxic sources have been excluded. This is especially important because of the lowered resistance in persons of advanced age. In this connection, MacCallum [3] wrote the following significant sentence: "With the advance of age, wasting becomes evident in many organs, if not in all, although the inconstancy with which it appears leads one to wonder whether other factors play a part."

Therefore, I will consider briefly, some of the most important senile changes that take place in the various tissues of the eye; some of the conditions arising from these changes; and, when possible, methods to mitigate the lot of the old person with failing sight.

OCULAR CHANGES IN OLD AGE

Eyelids.—Hippocrates noted that many old people become "hollow-eyed." In fact, the whole eye tends to become smaller in advanced age. The muscles of the eyelids become atonic, and the skin becomes smoother, thinner, less elastic and folded, producing concentric lines

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* From the Johns Hopkins Hospital, Wilmer Institute.

* Read before the New York Academy of Medicine, Graduate Fortnight, Oct. 12, 1928.

1. Brown, Sir Thomas: Pseud. Epx. **4**:217, 1646.

2. Smith, J.: Old Age, ed. , 1666, p. 257.

3. MacCallum, W. G.: Text-Book of Pathology, ed. 3, Philadelphia, W. B. Saunders & Company, 1925.

commonly spoken of as "crowsfeet." At times, the upper lid sags so much that vision is interfered with. The lower lid may turn out (senile ectropion), leading to degenerative changes in the conjunctiva and an annoying watering of the eyes. Or, the lid may turn in (senile entropion), causing great discomfort from the inverted lashes and sometimes leading to severe conjunctival inflammation, and even to ulceration of the cornea.

Ocular Muscles.—Paralysis of the external muscles has been mentioned by several authors as a senile condition; but, in my experience, this condition is seldom due solely to the changes of age.

Conjunctiva.—The thickness of the conjunctiva differs greatly in individuals, and it is much influenced by exposure to irritation and intercurrent inflammations. The aged conjunctiva shows atrophy of the subepithelial connective tissue with hyalinization, disappearance of the elastic tissue fibers and increased thickness of the epithelium, with a tendency to keratinization. Throughout life, the conjunctiva is more exposed than any other mucous membrane; therefore, the palpebral portion assumes a red and velvety appearance from enlargement of the papillae. Concretions of dead epithelial cells and hardened mucus form in the depressions lined with epithelium, called the glands of Henle. These accumulations, "lithiasis," look like calcareous deposits, and they frequently feel so to the patient. The ocular conjunctiva often becomes pigmented around the corneal limbus. On either side of the cornea, in the space between the eyelids, it becomes thicker and assumes a yellowish color similar to fat. The pinguecula is due to a hyaline degeneration and a local hypertrophy of the elastic tissue fibers. It is more marked in the case of inflammatory redness of the balance of the conjunctiva; and, occasionally, it is itself the seat of ulceration. In age, the conjunctiva as a whole becomes less elastic.

Tenon's Capsule.—Tenon's capsule, like the conjunctiva, differs much in density, according to its location. In age it becomes thicker, less elastic and infiltrated with fatty masses (figs. 1 and 2).

Sclera.—The sclera thickens, and becomes more rigid and yellowish; in a word, according to Salzmann,[4] the whole tunica fibrosa undergoes a certain degree of fatty degeneration.

Cornea.—The corneal changes of age have taken on a special interest since the introduction of the slit lamp and the corneal microscope. The apparent diameter of the cornea diminishes; it loses its luster and transparency, and, at times, it flattens, particularly in the vertical meridian, with a change in its relative radii of curvature. Astigmatism "according

4. Salzmann, Maximilian: The Anatomy and Histology of the Human Eye, Chicago, University of Chicago Press, 1912, p. 211.

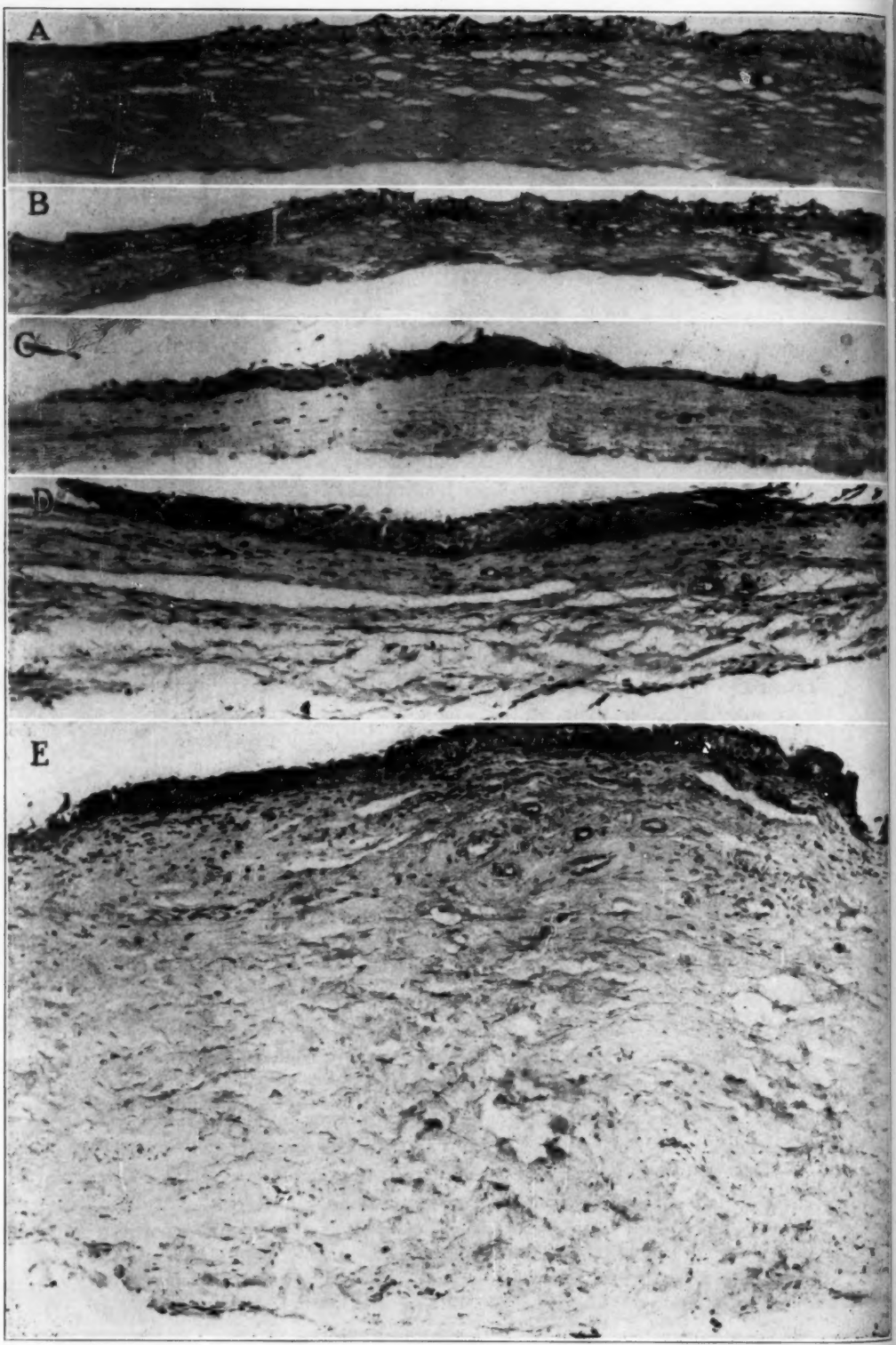

Fig. 1.—Conjunctiva in various decades of life: *A*, at birth; *B*, aged 22; *C*, aged 45; *D*, aged 60; *E*, aged 84. × 25.

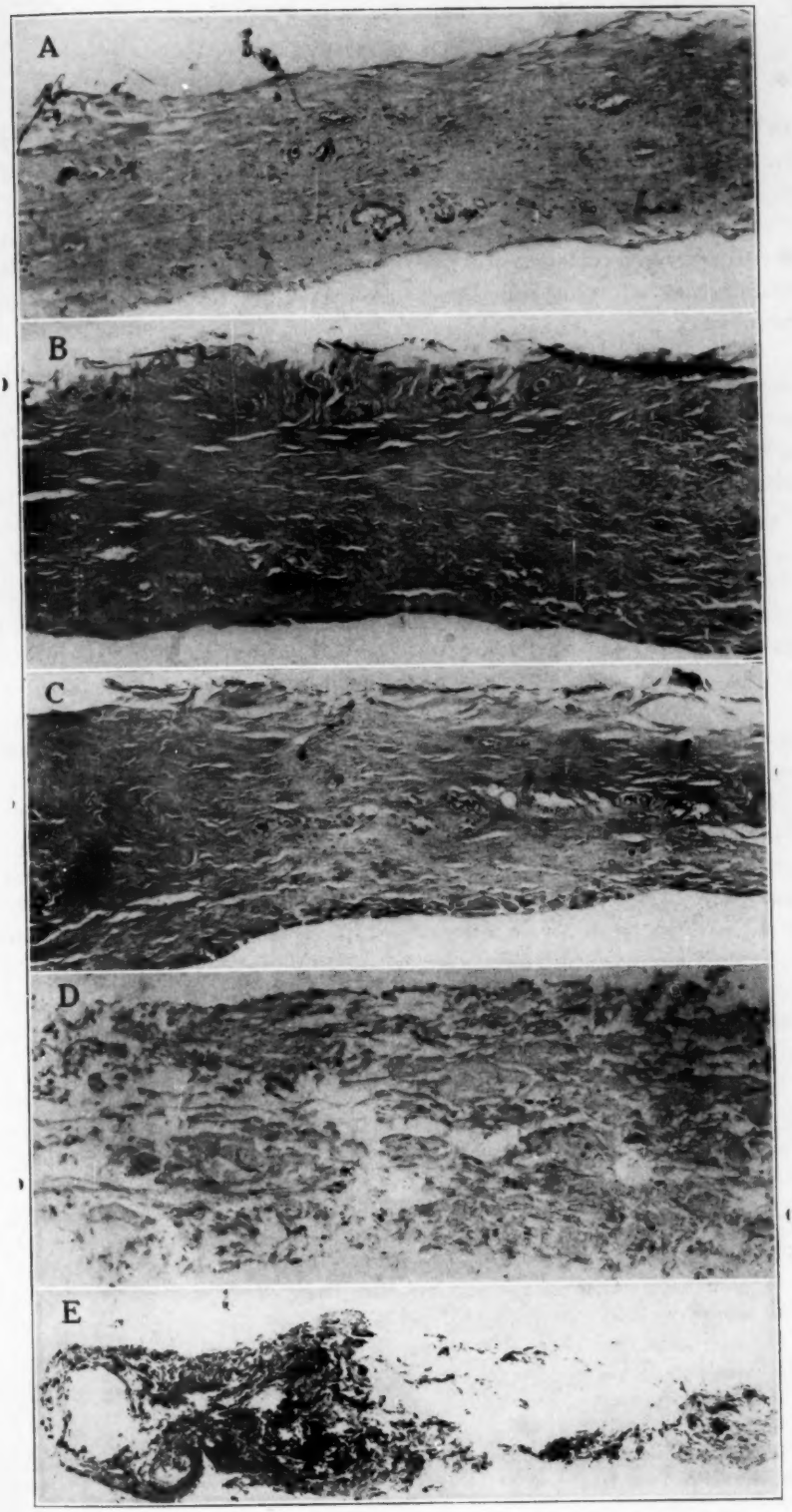

Fig. 2.—Tenon's capsule in various decades of life: *A*, at birth; *B*, aged 26; *C*, aged 45; *D*, aged 60; *E*, aged 64. × 25.

to the rule," tends to decrease; astigmatism "against the rule," tends to increase; but, in emmetropia, slight astigmatism "against the rule" results.

Kistler [5] showed that in dogs, as in human beings, the refraction of the cornea grows less with age; and Vogt [6] called attention to the increase in the internal reflection of the cornea at a level with Descemet's membrane.

With the corneal microscope, the beautiful mosaic appearance of the endothelial layer becomes less visible; and the cells assume a granular and amorphous appearance. Verrucosities (Hassel-Henle warts) in the periphery of Descemet's membrane are found in all adults (Vogt [6]). Migrated pigment granules from the iris and ciliary body are seen on the posterior surface of the cornea.

The opaque ring around the periphery of the cornea called, with poetic license, "arcus senilis" or "gerontoxon," is interesting. It is more frequent in old age than in youth; but I have seen it often in persons under 40, when there was some interference with the corneal nutrition, such as "pulsating exophthalmus." This opaque ring is separated from the limbus by a clear band of cornea; because Bowman's membrane, which is always involved, does not extend to the extreme periphery. This clear ring, however, is only superficial; for the opacity, which occupies also the deeper layers, does go to the limbus. The opacity is due to minute oil globules of fatty infiltration. Meesmann [7] suggested that it should be called "arcus lipoides," because a similar condition appears in young people. He further stated that it is associated with increase of cholesterin and other lipoids in the blood. He also called attention to hypercholesteremia in its relation to the lipoids in the walls of sclerosed blood vessels. A. Fuchs [8] mentioned the fact that feeding animals with cholesterin caused a whitish ring around the cornea similar in appearance to the arcus senilis (figs. 3 and 4).

E. Fuchs [9] described a "senile marginal atrophy" (peripheral furrowing keratitis of Schmidt-Rimpler), which sometimes appeared as a pure senile change. The opacity becomes broader, and its site in the cornea

5. Kistler, R.: Untersuchungen über die Refraktion von 105 Hunden mit Bemerkungen über senile Veränderungen des Rundesauges, Klin. Monatsbl. f. Augenh. **80**:188 (Feb. 24) 1928.

6. Vogt, A.: Atlas of the Slitlamp-Microscopy of the Living Eye, Berlin, Julius Springer, 1921.

7. Meesmann, A.: Die Mikroskopie des lebenden Auge, Berlin, Urban & Schwarzenberg, 1927.

8. Fuchs, Adelbert: Histopathology of the Eye, Leipzig, Franz Deuticke, 1924.

9. Fuchs, Ernst: Lehrbuch der Augenheilkunde, ed. 15, Leipzig, Franz Deuticke, 1926.

thinner, with a distinct furrow. Under the influence of intra-ocular pressure, the cornea may yield at the point where it is thinnest, and give rise to true ectasia.

Anterior Chamber.—The anterior chamber, which in early life has a vertical distance from the lens of about 2.8 mm. (Salzmann [4]), has a tendency to grow more shallow in senescence. This is due to the flatten-

Fig. 3.—Arcus senilis in a man, aged 67. Slit lamp. × 10.

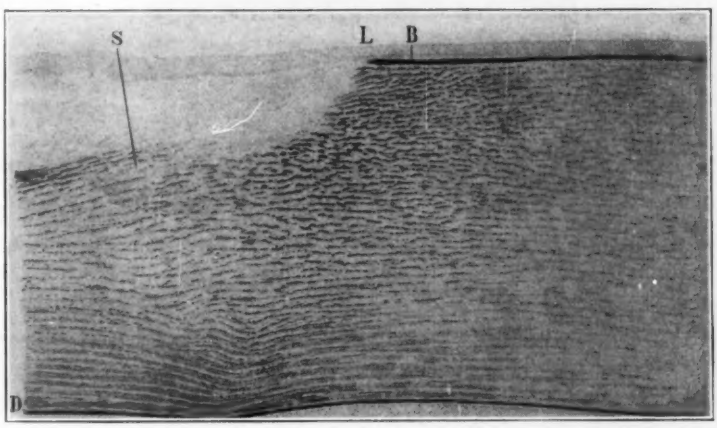

Fig. 4.—Arcus senilis (microscopic). × 70. *D* indicates Descemet's membrane; *S*, sclera; *L*, limbus; *B*, Bowman's membrane. (From Adelbert Fuchs.)

ing of the cornea and the increase in the size of the lens. There is also a decrease in the size of the posterior chamber. The change in the size of the anterior chamber has a marked influence on the occurrence of glaucoma.

Iris.—The iris in old people exhibits striking changes, when viewed with the slit lamp and corneal microscope. There is hypertrophy of the

connective tissue fibers, at the expense of the cells (whose protoplasm undergoes degeneration); hyalinization of the iris stroma; sclerosis of the blood vessels with increase of their visibility, and more prominence of the sphincter muscle. In the pigment epithelial layer, there is death of the cells and migration of the pigment granules. These are deposited on the posterior surface of the cornea, anterior surface of the lens capsule, and anterior surface of the iris. By transmitted light, these granules appear like minute, dustlike particles of black pepper; by direct illumination, like red pepper.

According to Hinen,[10] in the fifth decade, the stroma suffers most frequently (55.9 per cent, the border and posterior layer each 9.5 per cent); in the eighth decade, the stroma and the pupillary margin are

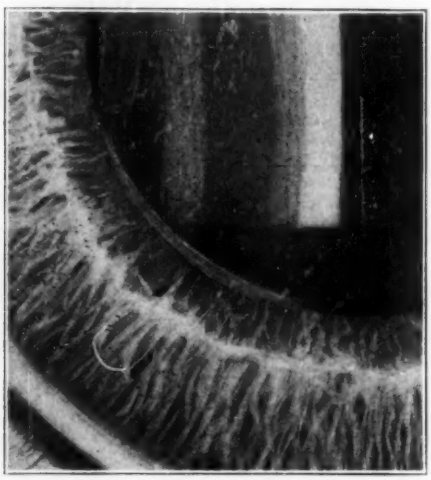

Fig. 5.—Atrophy of pupillary border in a patient, aged 84. Slit lamp. × 10.

affected in all cases, and the posterior layer in about 85 per cent. The border of the pupil, where the pigment has disappeared, looks homogeneous, like a glass membrane. The iris, as a whole, becomes thicker and more rigid. From these alterations, the pupils of old people become smaller and less mobile; and the color of the iris, especially in blue ones, changes to a lighter hue.

In people more than 75 years of age, I frequently find, in addition, the remains of a quiet iritis unnoticed by the patient. Before the days of the slit lamp, this condition was probably often overlooked. Even with the modern aids to diagnosis, the study is much simplified by the use of a mydriatic (figs. 5 and 6).

10. Hinen, quoted by Koby, F.: Microscopie de l'oeil vivant, Paris, Masson & Cie, 1924.

Ciliary Body.—In the ciliary body, similar degenerative changes take place. The thickening of the connective tissue elements causes an encroachment on the circumlental space, and influences the function of the ciliary processes, which are so important to the nutrition of the lens and vitreous.

Vitreous.—According to Addario,[11] rarefaction and shrinking of the vitreous fibrillae occur; and Vogt [6] said that the senile framework shows increased luminosity, and that the tunic-like vertical folds are especially visible and bright.

Fundus.—In old people, the retina takes on an epithelial character with loss of transparency and luster; and diffuse or circumscribed atrophy, affecting the pigment epithelium, gives rise to a tessellated appearance.

Fig. 6.—Partial atrophy of iris and migration of pigment granules after uveitis in a man, aged 49.

Terrien [12] stated that, in old persons, destructive vascular lesions are rarer in the retina than in other organs; but he agreed with many observers in regard to the vulnerability of the macular region. Cystoid degeneration of the retina is a common senile manifestation, but this change usually takes place in the extreme periphery, and is of little visual importance. The condition is usually discovered post mortem.

Sclerosis of the chorioidal vessels, which causes a stiffness and rigidity of this layer, is usually present. Colloid masses of varying size, on the surface of the chorioid, are commonly described as a senile change. It is true that the disturbed vascularity of age does cause them,

11. Addario, C.: L'involuzione senile del vitreo e della sua matrice ciliare, 10th Internat. Cong. Ophth., 1905, section B, p. 190.

12. Terrien, F.: Senile Changes in Eye, Paris méd. **12**:517, 1922.

but they also occur earlier in life under similar nutritive disturbances. To illustrate this, I am showing a picture of the fundus of a colored woman, aged 47, who was suffering from a number of bodily ailments (figs. 7 and 8).

In regard to senile central chorioretinitis, Fuchs [9] said that it occupies a position midway between a degeneration and an inflammation. Many authors (Coppez and Danis,[13] Harms,[14] Van der Hoeve [15] and others) described a senile macular degeneration of the retina. De Schweinitz [16] mentioned a senescent angiosclerosis of the fundus, which differs from the usual changes of arteriosclerosis by the retention of the regular vessel lumen and absence of arteriovenous compression, but with a pale disk. In my experience, these changes are much influenced, even in the aged, by focal infections and toxemias. De Schweinitz, with other authors, described a senile macular condition under the title of "retinitis atrophicans centralis."

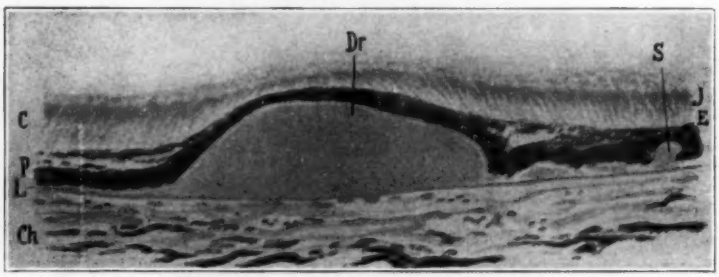

Fig. 7.—Colloid excrescences of lamina vitrea (microscopic). × 250. *Ch.* indicates chorioid; *L*, lamina vitrea; *P*, pigment epithelium; *C*, rods and cones; *Dr*, colloid excrescenses; *S*, small colloid excrescenses; *J*, internal retinal elements; *E*, external retinal elements. (From Adelbert Fuchs.)

Optic Nerve.—In addition to the fundus conditions already described, there occurs more rarely (and not easily recognized) a partial atrophy of the optic nerve. De Schweinitz said there is a "type observed in elderly people characterized by atrophic pallor of the optic nerve, without shrinking, sometimes associated with senile retinal sclerosis." In these cases, the central vision may be reduced little, and the visual fields

13. Coppez, H., and Danis, M.: Symptomes objectifs et subjectifs de la retinite exudative maculaire senile au debut, Soc. franç. d'ophth. **37**:490, 1924.

14. Harms, C.: Anatomisches über die senile Maculaaffektion, Klin. Monatsbl. f. Augenh. **42**:448, 1904.

15. Van der Hoeve, J.: Senile Maculadegeneration und senile Linsentrübung, Arch. f. Ophth. **98**:49, 1919.

16. De Schweinitz, G. S.: Diseases of the Eye, Philadelphia, W. B. Saunders & Company, 1924.

only slightly contracted. E. Fuchs [9] said that in such cases, there may be an impairment of vision with little ophthalmoscopic change. The condition may be due to a blocking of a small nutrient vessel in the nerve, with a localized atrophy. A. Fuchs [8] described such a case in a man, aged 70, who died from leukocythemia; the optic nerve condition was discovered incidentally (fig. 9).

E. Fuchs [9] called attention to the fact that a partial atrophy of the nerve may be due to actual pressure on its delicate fibers by a sclerosed internal carotid, or ophthalmic, artery.

Lens.—The senile changes of the crystalline lens, when studied by the aid of the slit lamp, are so interesting that one is tempted to give too much time to this structure.

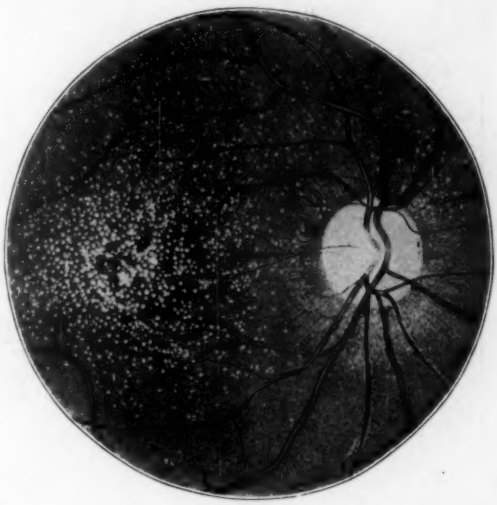

Fig. 8.—Colloid excrescences in a patient, aged 47, simulating a senile change (ophthalmoscopic).

In general, age tends to produce a shrinkage in the tissues and organs of the body. Quite different from this rule is the behavior of the lens, which continuously grows larger through the whole of life: the increase in diameter may amount to 1 mm., and in thickness a trifle more. As Salzmann [4] graphically stated: "One can deduce the form of the senile lens from that of the youthful lens if one thinks of it as surrounded by a shell some 0.5 mm. thick." The margins of the lens become more rounded. The cells of the anterior lens capsule are cubical in youth, but later on in life they become flattened out by the pressure of the enlarging lens. They may shrink to such an extent that little more than their nuclei can be seen on the inner surface of the hyaline

membrane (Collins and Mayou [17]). This membrane becomes uniformly thickened, with minute deposits of colloid material.

Time will allow the consideration of only some of the more important changes recognized in the lens of the living eye by means of the slit lamp and microscope. There is an increase in the internal diffuse reflection of light; the surface of the adult (senile) nucleus becomes more marked and its lamellae more distinct; according to Meesmann, a buckling forward of the seams of the lamellae causes variously shaped prominences. If the beam of light is thrown in the eye very obliquely, it makes more clear the shadows of the protrusions. Similar changes take place on the posterior surface. The lens becomes fluorescent and yellowish. This tint becomes so marked in the posterior layer that the

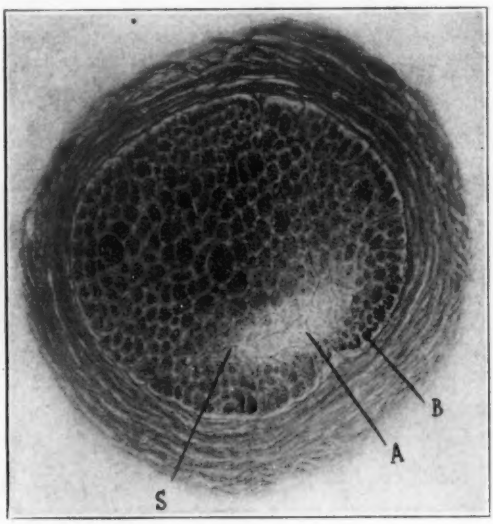

Fig. 9.—Senile atrophy of optic nerve, partial (microscopic). Pal-Weigert stain. × 20. *A* indicates atrophic focus; *S*, septums; *B*, nerve bundles. (From Adelbert Fuchs.)

beam of light takes on a dark orange hue. The coloration is really greater in the nucleus, but the light rays reflected from the posterior capsule have to traverse all of the lens to reach the eye of the observer, and each layer adds to the depth of the color. By reflected light, in the miosis of age, this change gives rise to a yellowish gray appearance of the pupil, which might be mistaken for cataract. There is also greater absorption of the spectral colors, particularly the blues and greens, which results in reduction of the normal color perception for the blue end of the spectrum.

17. Collins and Mayou: Pathology and Bacteriology of the Eye, Philadelphia, P. Blackiston's Son & Company, 1925.

From early youth the nucleus increases in size and hardness, until in advanced age, as a result of this process of dehydration and sclerosis, the lens is practically all nucleus, and inelastic like old rubber. As Shakespeare's cynical Jacques says, "and so from hour to hour we ripe and ripe, and then from hour to hour we rot and rot" (figs. 10 and 11).

Presbyopia.—The changes just described give rise to presbyopia, the senile failure of accommodation. This failure is due not to diminution in strength of the ciliary muscle, but, chiefly, to the inelasticity of the lens and decrease in its index of refraction, supplemented, perhaps,

Fig. 10.—Crystalline lens in a boy, aged 10. Slit lamp. × 10.

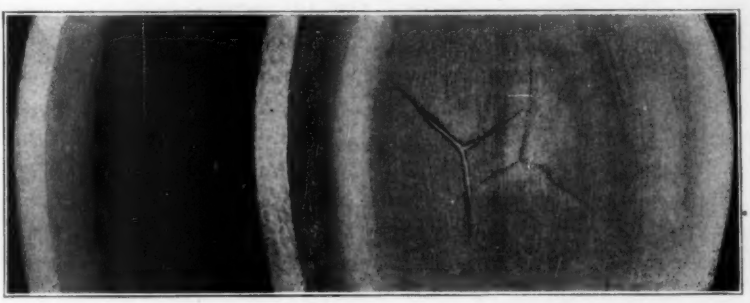

Fig. 11.—Senile lens in a woman, aged 71. Slit lamp. × 10.

by shrinkage of the coats of the eye, flattening and lessened refractive power of the cornea, advance of the focus by miosis, etc. In very old people, the lens acquires a double focus; so that the presbyope reads better in a brilliant light, owing to the reduction in the circles of dispersion by the contracted pupil, while, on the contrary, the majority of people with cataract require the greater amount of light afforded by a larger pupil. As a precursor of cataract, the index of refraction of the lens is occasionally increased, producing "second sight" and allowing the person to lay aside his reading glasses. I have observed this phenomenon in several generations of a family.

Cataract.—The senile lens is subject to the development of a great many kinds of opacities—cataract.

When published, the Fourteenth Decennial Census of the United States [18] will state: "After 64, cataract becomes the foremost cause of blindness, being responsible for 34.1 per cent of all blindness at that time of life." . . . "Almost one-half of the blindness resulting from cataract occurs after 64 and nearly three-fourths after 44, or after the prime of life." According to Vogt,[6] "more than 90 per cent of all individuals over 60 years of age show senile lens changes of various degrees." Jackson [19] found that of 732 patients, over 50 years of age, who consulted him for all kinds of eye trouble, 53.4 per cent showed opacities of the lens. From this series, with an average age of 65.35 years, Dr. Jackson said: "The probability is that under proper hygienic care it will be twenty years before the cataract becomes mature and fifteen years before he loses the power of reading ordinary print." A great difference is shown by the various types of opacities of the lens in their tendency to increase; for example, spokelike opacities in the cortex tend to increase more rapidly than nuclear ones.

In addition to the lenticular changes mentioned, in cataract there is hydrolysis of the lens protein with the formation of tyrosin and cholesterin.

The most probable cause of cataract, according to Parsons,[20] is the nutritive disturbance of the lens due to general faulty metabolism, possibly from the formation of specific autocytotoxins.

Glaucoma.—The census report already mentioned, will say: "Glaucoma is also distinctly a disease of later adult life, nearly one-half occurring between 45 and 64." . . . "From 45 to 64 (late middle life) glaucoma percentage increases, more than trebling." . . . "Glaucoma registers a great increase, the proportion in 1920 being nine times that for 1890 and about one and a half times that for 1910 (increase in number of aged in general population)." After the age of 30, its relative incidence increases with every decade, and its importance is enhanced by its being a bilateral condition.

Some of the age factors in the development of glaucoma are: the increase in thickness and loss of distensibility of the sclera; swelling of the lens in beginning cataract; lessened size of the anterior chamber, which causes a decrease in the filtration angle and a pressing together of the meshes of the ligamentum pectinatum, and sclerosis of the ciliary processes and their encroachment on the circumlental space. Under

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18. Fourteenth Decennial Census of the United States, 1920, to be published.

19. Jackson, Edward: Senile Cataract under Hygienic Care, Tr. Am. Ophth. Soc. **22**:85, 1924.

20. Parsons, J. H.: Diseases of the Eye, ed. 4, New York, The MacMillan Company, 1923, p. 291.

these conditions, any further reduction in the filtration angle may induce glaucoma. For this reason, one should be cautious in the use of a mydriatic in old people. These changes were aptly summarized by Priestly Smith,[21] who said that in some cases the lens becomes too big for the eye. In the aged, glaucoma is more apt to occur in the smaller eyes of hyperopes than in others.

There is probably a change in the character of the aqueous in old age, as there is in the secretion of the ductless glands. Perhaps, the decline in the secretion of the suprarenals renders the eye an easier prey to glaucoma. Vasomotor disturbances are of serious import. Some years ago, in the course of a few hours, I saw two elderly women with acute glaucoma. In one case, the attack was caused by the shock of the announcement of the sudden death of a brother; in the other (a person who was dependent on clerical work for a livelihood) by the joy of a telegram bringing the unexpected news of a good annuity.

THERAPEUTICS

Drooping of the upper eyelid becomes so marked at times that, while the patient reads, the lid has to be raised by the fingers, or by support mounted on the upper rim of the spectacles. Cure is easily produced by the cutting out of a strip of skin as long as the lid, and from 4 to 5 mm. wide. A local anesthetic is used, and the wound is closed by a subcutaneous stitch of fine silk.

Senile ectropion, in mild cases, can be relieved by the simple method of galvanopuncture, as suggested by Ziegler. Strict aseptic precautions, and a local anesthetic should be used. After the eyelid is firmly fixed with a lid clamp, a number of punctures are made on the conjunctival surface, about 4 mm. from the margin of the lid. I get the best results by placing the punctures close together (2 mm. apart). This cauterization is usually sufficient in the relaxed tissues of old people. However, there are a number of more formidable surgical procedures for shortening the lid, which are satisfactory.

In both entropion and ectropion, only the lower eyelid usually is involved. Temporary relief of entropion can be obtained by the use of collodion or strips of adhesive plaster. For a cure, I will describe a method simpler than a more formal surgical procedure, and one that has never failed when properly carried out. Butyn 1 per cent is instilled in the lower culdesac, and the surface of the skin is anesthetized by the injection of from 1 to 2 cc. of a 1 per cent solution of procaine hydrochloride, containing 4 minims (0.24 cc.) of epinephrine hydrochloride to the ounce. A stick of caustic potash is sharpened on a piece of wet sterilized blotting paper. After the insertion of a spatula, the skin

21. Smith, Priestley, quoted by Salzmann (footnote 4).

surface of the lid is cauterized by the caustic pencil with a gentle stroking motion parallel to the margin of the lid, and about 4 mm. from it. The skin should be perforated, and the width of the cauterized surface may vary from 2 to 5 mm. The caustic action can be stopped, when desired, by an application of a 1 per cent solution of dilute acetic acid, or by vinegar. During the procedure, the lid returns to its proper position and remains there. The wound may be covered with a bichloride salve 1 : 10,000. A bandage is unnecessary. Considerable reaction immediately follows this proceeding, but it subsides quickly under applications of ice. The patient is not incapacitated, and no appreciable scar results. The operation can be performed without shock, in old or infirm people, and it is applicable before a serious intra-ocular operation, when the patient is suffering from the annoyance of the inturning lashes.

"Lithiasis" sometimes occasions much discomfort, giving rise to a feeling of cinders in the eye. These concretions should be incised singly with a sharp pointed cataract knife, and the accumulated masses removed by a minute curved foreign body spud. With the use of butyn and epinephrine hydrochloride, the procedure is painless.

Pinguecula in old people does not require treatment, except in those cases in which it becomes inflamed or ulcerated. When this occurs, the condition quickly subsides under a simple treatment of irrigations with a 3 per cent solution of boric acid, the application of 0.5 per cent solution of silver nitrate on a cotton applicator and the bedtime use of acriflavine.[22]

Furrowed keratitis, in the aged, is fortunately not common, according to my experience. But it can be relieved by attention to the general bodily condition, and locally, by irrigations several times a day with a boric acid solution, followed each time by the acriflavine. In some cases, a pressure bandage between treatments is helpful.

Iritis.—The quiet iritis, so often seen in the aged, requires treatment that does not differ from that used in younger people. In completing the diagnosis, however, a mild mydriatic is helpful. In these cases, and for ophthalmoscopic examination of the fundus, a 5 per cent solution of ephedrine is usually sufficient; but a combination of this drug with an equal proportion of a 5 per cent solution of euphthalmine makes a satisfactory mydriatic. However, in all old people it is wise to contract the pupil after the examination, by a 0.5 per cent solution of pilocarpine.

Retina and Uveal Tract.—In the case of lesions of the uvea and retina in old people, it is particularly important to make a thorough survey to exclude all bodily toxic sources. Among the aged, the teeth

22. One part of a 10 per cent solution of acriflavine in alcohol, to 1,500 parts of refined castor oil.

and intestinal tract especially should be considered; examinations of the blood and urine are also most important. After the removal of all discoverable causes, rest of the eyes, protective glasses, hot applications and a long continued bedtime use of a mild solution of dionin are helpful. In inflammations of the anterior uvea, the treatment does not differ from that indicated in youthful subjects, except in the greater caution necessary in the use of mydriatics.

Optic Nerve.—Partial atrophy of the optic nerve as a purely senile manifestation is rare. The only help available is through the improvement of the bodily condition, and amelioration of the cause.

Presbyopia.—One of the greatest boons vouchsafed to humanity has been the production of lenses. Without their aid, Hawthorne's words would fitly describe the fate of many senescents: "So age-worn and woful are they." There are many practical points worth considering in prescribing presbyopic glasses, but only a few of the most important can be mentioned. The lenses should be carefully adjusted for the distance at which the person desires to use his eyes. That distance varies greatly in musicians, the clergy, artists, typists, clerks in stores, mechanics and others. It adds greatly to the comfort of old people, at times, to have glasses not only for distance and for reading, but also for intermediate distances, such as for cards, music, billiards and picture galleries. Particular pains should be observed in the proper correction of the astigmatism, which changes with advancing years. The glass should be as weak as possible to answer the purpose. In the first decade of presbyopia, there is a tendency to prescribe glasses that are too strong. This favors the increase of presbyopia, limits the range of ocular efficiency and alters the normal relation between accommodation and convergence, with the result of physical discomfort and reflex nervous disturbances. This is especially prone to occur, if the patient has a preexisting insufficiency of convergence. Under these circumstances, the presbyope may have discomfort with his new glasses, in spite of their not being too strong. Converging exercises are helpful. In the case of hyperphoria, the appropriate prisms in the glasses give comfort, but prisms, base in or out, should be prescribed only as a last resort.

After 45, one who is under a great nervous strain, or who has to use his eyes strenuously, often suffers from various reflex symptoms, without placing the responsibility on the eyes. No one more clearly understood this relationship than Weir Mitchell, as the following account will illustrate.

In 1899, one of my distinguished townsmen consulted this great neurologist on account of headaches, insomnia, gastric disturbances, etc. The patient seemed to be in excellent physical condition, and after

listening to all the symptoms, Dr. Mitchell said: "I think your troubles come from eye-strain: get the proper glasses for your near work, and, if you are not relieved come back to me." To the ophthalmologist, Dr. Mitchell wrote this characteristic note: "Dear ——: Please Gould [23] Glover." Dr. Mitchell's diagnosis was promptly verified by the relief afforded by the glasses.

Senile Cataract.—Among the great number of people with cataract, there are many who dread the knife. This creates a large class of patients who seek cures in impossible places. I operated on an intelligent woman who had previously gone to live in South America in order to use, in its native habitat, a plant famed for its cure of cataract. Before that, she had exhausted the knifeless cures of Europe! I have seen patients who tried everything from powdered glass to radioactive lenses at $1,000 a pair. This class of eager pursuers of therapeutic "will o' the wisps" is not by any means composed entirely of the ignorant.

The method of dealing with old people affected with cataract, is one of great psychologic importance. I have frequently examined the eyes of patients in this condition, when they have been most unhappily waiting, in idleness, for a cataract to "ripen" which did not "ripen." Often, old people have been brought to me with the request: "If mother has a cataract, please don't tell her. I fear the effect of the shock on her health." Invariably, I decline to make an examination without full liberty to tell the patient the actual facts so far as I deem it wise to do so. In such cases, my experience agrees with Jackson's [19]—that "the persons have been as grateful for the removal of their dread as they could have been for the removal of their cataracts." The usual response is: "I am so glad to learn what causes the little blur before my eyes. Now that I know it is not from a serious, incurable disease, I can use my eyes and be happy."

Patients with senile cataracts, form a large part of one's private, as well as hospital, practice; and it might not be entirely without profit to consider some factors which may add to the comfort of this class.

1. In spite of the person's age, it is wise to make a survey for any contributing bodily condition, with the hope of removal or mitigation. Teeth, colon stasis and hyperglycemia are particularly important.

2. The diet should be carefully balanced, with a reduction in the amount of meat, carbohydrates and salt; the use of green vegetables, and sufficient water taken between meals.

3. Treatment should be given for any coexisting ocular lesion, especially of the uveal tract.

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23. At that time, Dr. George M. Gould was writing much about the cure of many ills by wearing glasses.

4. The alleviation of senile cataract has been sought in medicine, physiotherapy, serology and radiology; but it is difficult to correlate the remedy with the nonprogression of, or the improvement in, the lenticular opacities, for the reason that a large proportion of senile cataracts either progress slowly or remain stationary. A mild solution of dionin, however, over a long period, and hot applications followed by cold may be used with the hope of aiding the nutrition of the lens.

5. If the opacity is central, and there is not any indication of glaucoma, a mild mydriatic improves vision by admitting more light. In such cases, I advise a 1 per cent solution of homatropine, combined with a 5 per cent solution of ephedrine, to be instilled in the eyes every morning, with the permission to use an extra drop in the afternoon on special occasions.

6. In advanced age, the miosis and rigidity of the pupil increase the visual impairment caused by the cataract. In such cases, even when there is a tendency to glaucoma, much comfort is rendered by a simple reading device consisting of a piece of black rubber, 6 by 4 inches (15 by 10 cm.) in the center of which there is an aperture 4 by ¼ inches (10 by 0.6 cm.). It is thin and light and can be easily moved down the page in reading, the aperture making clear all the print within its space. It lessens pupillary contraction, which is caused by a large white reflecting surface, gets rid of blurred secondary images and reduces irregular astigmatism, and spherical aberration. Like the mydriatic, this device sometimes makes reading possible for persons too ill or infirm for an operation, or renders an operation unnecessary. In other cases, it enables one to read until the cataract can be extracted. Nearsighted persons can use the slit without glasses; the farsighted persons can use their regular reading glasses in addition. The ordinary hand magnifying glass or the newer telescopic lenses may give added help (fig 12).

7. In old people, as in younger ones, the ophthalmologist is confronted with many cases in which the lens becomes too opaque for useful vision, although the cataract is not mature in the usual sense of the word. In the aged, the problem is simpler than in youth; because practically the whole lens is hard, and it may be extracted by the usual combined method, or in capsule. In case there is some soft cortex, and the lens is extracted without its capsule, the proceeding is rendered safer by desensitization of the patient to lens protein beforehand, if the intradermal test has shown that this is necessary.

8. Not the least of the therapeutic measures, is the encouragement of the patient to use his eyes under the best condition of print, illumination, lenses, etc.

Glaucoma.—As already stated, glaucoma chiefly belongs to the later decades of life. It is of the utmost importance to recognize early the acute attack, with its accompaniments of a general feeling of illness, and distressing nausea and vomiting, which often mask the symptoms in the eyes. It is not seldom that patients with glaucoma are sent to the surgical wards under the impression that there may be a tumor of the brain. Such attacks often yield to a hot bath, a cathartic, rest in bed and morphine (without atropine), and, locally, pilocarpine, epinephrine and hot applications.

Fig. 12.—Black rubber reading slit in use.

But it is the insidious, unnoticed, chronic form of glaucoma that exacts such a toll of sight. Pain is absent and, until late, vision is not disturbed. In fact, there is such a lack of symptoms that the discovery of the malady is often incidental, while the eyes are being examined for glasses or some minor ocular trouble. Occasionally, the intelligent patient himself makes the discovery by noticing a contraction of the peripheral vision.

Elderly people, particularly hyperopes, should be taught that the disease is insidious, and that a regular examination of the eyes, like that of the heart and kidneys, offers the best means of preventing the disaster that comes when the glaucoma is recognized too late. In such patients, the ophthalmologist should make a particularly careful exami-

nation, testing the visual fields, as well as the central acuity of vision. In every instance, the intra-ocular tension should be tested with the fingers, and, in case of doubt, with a reliable tonometer. One must also take into account the fact that usually the tension is less in age than in youth. Especial care to exclude glaucoma should be taken when the patient has lenticular opacities; because the "blur" of which the patient complains may be attributed to the lenticular changes. Unfortunately, one too often sees patients nearly blind from glaucoma, who have been waiting for stationary opacities of the lens to become "ripe."

The danger of using mydriatics in old people with shallow anterior chambers is realized, but the seriousness of using a strong miotic is not so well recognized. I have seen several cases of chronic glaucoma, progressing satisfactorily during treatment with a mild solution of pilocarpine, converted into an acute attack within two hours after the instillation of a 1 per cent solution of eserine.

In a certain proportion of cases, the glaucoma can be controlled throughout the patient's life by careful attention to bodily conditions, the use of miotics, etc. But if the patient has lenticular opacities in addition, the problem is much more complicated. The miotic may relieve the intra-ocular tension, but it will also make the vision worse, by reducing the amount of light that reaches the retina.

If the glaucoma cannot be controlled by the treatment mentioned, one should not hesitate, on account of the patient's age alone, to employ the operation appropriate for the individual case.

EPITOME

An ancient philosopher considered "Age itself a disease"; a modern philosopher said that age, like youth, is rather a state of mind than a time of life. The latter view is more inspiring to the student of preventive medicine and of the humanities.

Experience teaches that some persons are comparatively young at 80, and others are old at 40. A distinguished pathologist, in considering the wasting of the organs in the aged, wondered if factors other than age do not play a part in this process. A noted physician [24] feit that presbyopia is definitely hastened by intestinal intoxication.

The effects of disease in the young simulate the degenerative changes of age. In the ocular abiotrophies, certain tissues present, at birth, the appearance of age; or they may have implanted in them the seeds of premature senility. In youth, a wasting disease may cause one to look "hollow-eyed," with malposition of the lids; there is an arcus juvenilis as well as an arcus senilis; dystrophies of the cornea change its curva-

24. Clarke, Ernest, quoted by Williams, Leonard: Middle Age and Old Age, New York, Oxford University Press, 1926, p. 204.

ture, its translucency and its luster. Cataracts may be congenital, or they may occur early in life from nutritive or toxic disturbances of the lens. Infection may cause uveal and fundus changes not unlike those that are called senile. Inflammations, also, induce the disintegration of the pigment epithelial cells of the iris, with atrophy and migration of the pigment granules. Glaucoma may be congenital from a fault in tissue development, or it may follow intra-uterine inflammation. The senile condition, "retinitis atrophicans centralis," is simulated in youth by traumatic or inflammatory lesions of the chorioid and retina (so-called "hole in the retina").

Human life is being prolonged by modern science, but, with the gift of these extra years, is linked the burden of the ailments of age—lesions of the heart, cerebral hemorrhage, nephritis, cataract and glaucoma. To these conditions, unemployment is frequently added, and the problem becomes one of economic as well as humane interest.

Those persons advanced in years are not able to continue the bodily activities of youth: eyesight becomes more precious, whether it is needed in gaining a livelihood, or in making less somber the shadows of the "evening of life." It is not possible to present an "elixir of life" or "fountain of ageless youth," but one can well afford to heed Cicero's admonition concerning the effects attendant on long life: "To counteract their progress by constant and resolute opposition, and to combat the infirmities of old age as we would resist the approaches of disease."

HISTOLOGIC OBSERVATIONS IN A CASE OF LOCALIZED TUBERCULOUS CHORIORETINITIS *

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The most frequent type of choroiditis, at least in my experience, is that which, for convenience, I shall designate localized chorioretinitis. In the textbooks, this condition is inadequately described. In a typical early case, there is seen in the fundus a rounded or oval, almost white, slightly elevated area with ill defined margins, which may be about the size of the optic disk or several times larger. Within this area, the retinal vessels may be partly or wholly obscured, while the vessels approaching it may show white mantles and apparently constricted lumina. Occasionally, small hemorrhagic extravasations are seen within or adjacent to the area. In this vicinity, a number of small white spots may be observed, and rarely there is a smaller area nearby, similar to the larger one. The vitreous is filled with fine opacities. Later, there may be moderate ciliary congestion, descemetitis and, in severe cases, posterior synechia. A delicate exudate may extend into the vitreous from the porus of the optic disk. The area becomes more or less pigmented, but, as a rule, not markedly so until healing begins. The vitreous opacities may become larger and more numerous, and finally completely obscure the fundus. After the process subsides, there is left an atrophic, irregularly pigmented area in the choroid. The retinal vessels usually resume their normal appearance.

The lesion may be situated anywhere in the fundus. It is rarely directly in the macula, but may extend into the latter. In some cases, it is situated so far toward the periphery that it can be seen only when the pupil is fully dilated. No doubt in many cases its position is so near the periphery that it cannot be seen at all, so that the diagnosis can be made only by inference. In some cases, the disease may cause glaucoma, which requires operative intervention. This may occur so early that the condition may be mistaken for primary glaucoma. Rarely, the condition may cause separation of the retina. In some cases, the vitreous is so cloudy when the patient is first seen that the choroidal lesion is invisible, and the diagnosis cannot be made with certainty until later, when the vitreous has cleared. Often, however, even when the

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* From the Massachusetts Eye and Ear Infirmary.

* Presented before the American Ophthalmological Society, Washington, D. C., May 1, 1928.

vitreous is markedly hazy, the lesion can be recognized as a brighter area behind the cloud.

The condition is not often bilateral, but recurrences in the same eye are common. The recurrence may take place within the old lesion, at its periphery, or a short distance from it. Young children are seldom affected, but otherwise age does not seem to be an important factor. Clinical evidences of tuberculosis elsewhere in the body are either slight or entirely lacking.

This disease has sometimes been considered tuberculous, but it is commonly regarded, in this country at least, as due to some other type of focal infection. I have never held this view, for I cannot conceive of streptococci or other pyogenic organisms giving rise to ocular lesions of this kind. Generally, one or more teeth are extracted, the tonsils are removed, or the accessory sinuses are operated on. If the ocular condition then improves, it is regarded as due certainly to pyogenic focal infection. I have observed, as a matter of fact, that these lesions almost always heal within a year, with or without treatment. Not infrequently, a healed lesion of this kind is found in the eye of a patient who is unaware of its presence, and who denies knowledge of any previous ocular disturbance. That the lesions usually heal without greatly damaging the eyes is also evidenced by the fact that the eyes are almost never removed.

Although the type of choroidal lesion just described is frequently seen with the ophthalmoscope, the opportunity to examine such a lesion microscopically seldom presents itself. This may be due to the fact that, in the exceptional cases in which enucleation becomes necessary, the process usually loses its original localized character. During the past twenty-seven years I have examined every eye removed at the Massachusetts Eye and Ear Infirmary, as well as many eyes obtained from private sources, and only in the following case have I discovered a localized active lesion of this kind.

I did not see the patient, and I obtained the clinical data from Dr. J. W. Jervey, who removed the right eye and submitted it to me for microscopic examination.

REPORT OF CASE

Mrs. Nettie J., aged 67, was first seen on Feb. 12, 1927, at which time she complained of failing vision in the right eye. After considerable questioning, it was elicited that about six months previously, a few days before the trouble in this eye started, a piece of wire grass was driven into the eyeball and stuck there. The right eye was completely blind, except for doubtful central light perception. There was a low-grade congestion, the cornea was slightly steamy, the pupil contracted and practically immobile, the iris discolored and the pupillary area covered with plastic exudates. A fundus reflex was not obtainable. The tension was 25 mm. of mercury (Schiötz). The left eye was normal; vision, 20/30.

On Feb. 28, 1927, the left eye showed well marked uveitis, "undoubtedly of sympathetic origin." There was marked ciliary congestion, and the corneal and pupillary deposits prevented an ophthalmoscopic view of the fundus. The pupil was of normal size and almost immobile, the iris thickened and discolored and the anterior chamber deep. The tension was 35 mm. of mercury (Schiötz); vision, 10/40.

The right eye was enucleated on March 1, 1927.

Under intensive treatment, including parenteral protein injections, the inflammation in the left eye soon began to improve, though the vision fell at one time to 10/100. When the exudates began to clear up, it was found that the anterior vitreous was dense, with dustlike opacities. This was noted about March 18. Improvement was slow, but, by March 28, the corneal deposits could barely be discerned with the loop, the pupil was well dilated, and the bulbar congestion almost cleared up. By April 5 the vitreous opacities were much less dense, vision $= 15/30$, and the tension, 18 mm. (Schiötz). On April 13 the vision with $+ 0.75$ sph. $= 20/30 - 1$. The tension by palpation felt normal. The ophthalmoscope revealed a few minute corneal deposits remaining, and also some very fine dust-

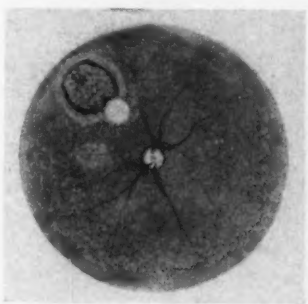

Fig. 1.—Macroscopic appearance of lesion in fundus of enucleated right eye after fixation.

like opacities in the vitreous. The fundus appeared absolutely normal. The eye was entirely free from inflammation.

PATHOLOGIC EXAMINATION

Fixation was carried out in 10 per cent formaldehyde for several days, and in 70 per cent alcohol containing 2.5 per cent hydrochloric acid for twenty-four hours. Celloidin sections were made so as to include the choroidal lesion and optic disk.

Macroscopic.—On the opening of the globe, which was normal in size and shape, the vitreous was found to be separated from the retina by a large amount of turbid fluid. In the fundus up and out from the disk there was an almost circular grayish area, 9 mm. in diameter, stippled with pigment and bordered by an unpigmented rim, inside of which was an ill-defined ring of pigment (fig. 1). Toward the disk, but involving the periphery of this area, was a white area, 3 mm. in diameter. Its nearest margin was about 4 mm. from the disk. The eye did not show any evidences of a perforating wound.

Microscopic.—At the center of the large area the choroid was increased to four times its normal thickness, and its original structure was not recognizable. Its inner half was replaced by epithelioid cells, among which were many Langhans'

giant cells, while its outer half was densely infiltrated with lymphocytes and plasma cells (fig. 2). The chromatophores, except along the sclera, were completely destroyed, leaving only faint traces of their pigment. No vessels were recognizable, except near the sclera, where a few small ones were seen. Bruch's membrane was intact, but the pigment epithelium had been destroyed. The retina was here almost free from infiltration, but was completely necrotic. It had been converted into an eosinophilic granular material containing scattered pigment-granules and numerous round masses of pigment, evidently left by migrated cells of the pigment epithelium. The hyaloid membrane was intact, and the inner surface of the retina was smooth. As the periphery of the lesion was approached, the choroid became thinner, its vessels became visible, and the epithelioid cells gradually disappeared. The necrotic condition of the retina became less marked, and the pigment epithelium and rods and cones rather abruptly reappeared. The lymphocytic infiltrate in the choroid

Fig. 2.—Section passing through centers of main lesion and smaller focus at its periphery. Hematoxylin and eosin stains. Photomicrograph; × 6.

Fig. 3.—Central portion of main lesion showing epithelioid cells and giant cells in choroid, and necrosis of retina. Hematoxylin and eosin stains. Photomicrograph; × 54.

continued for about 1.5 mm. farther. Near the margin of the lesion the amount of scattered retinal pigment-granules and clumps of pigment notably increased. This accounted for the ring of pigment seen macroscopically (fig. 1).

The changes seen in the smaller area differed considerably from those in the main lesion. Here the process was centered in the retina. The pigment epithelium had been destroyed, and the retina was completely replaced by epithelioid cells, among which were numerous giant cells, so that not a semblance of the original structure of the retina and not a trace of retinal pigment remained (fig. 3). The hyaloid membrane was destroyed. The choroid was about three times its normal thickness, but the thickening was due almost exclusively to infiltration with lymphocytes and plasma cells, only a few minute foci of epithelioid cells and an occasional giant cell being seen within the choroid here. At the periphery, within

a distance of 1 mm., the pigment epithelium and rods and cones reappeared, and the retina became relatively normal.

The sclera behind the choroidal lesion showed slight infiltration with lymphocytes.

Elsewhere than in the immediate vicinity of the lesions just described the inflammatory changes in the eye were confined chiefly to the retina and iris. The choroid was normal, showing scarcely a trace even of lymphocytic infiltration. The retina was entirely free from edema and hemorrhages, and the changes in it related to its ganglion cells, veins and inner surface. In the macula the ganglion cells were almost intact, but elsewhere they had almost entirely disappeared. Almost every retinal vein was surrounded by a mantel of lymphocytes. On the surface of the retina were numerous collections of epithelioid cells with a few lymphocytes. Most of these collections were more or less compact, forming definite nodules within which there were often giant cells. The nodules were largest and most numerous in the vicinity of the choroidal lesion and at the equator below. Often they formed semicircles, with their concavities toward the retina. A nodule or collection of epithelioid cells was found opposite practically every retinal vein

Fig. 4.—Central portion of smaller focus, showing retina replaced by epithelioid cells, and choroid infiltrated with lymphocytes and plasma cells. Hematoxylin and eosin stains. Photomicrograph; × 85.

seen, but nodules also occurred without apparent relation to the veins. On the inner surface of the hyaloid membrane, in places there were newly formed membranes composed entirely of spindle cells, probably derived from the retinal neuroglia. Some of these membranes reached a thickness of seven cells and were 2 mm. in extent. Between the spindle cells were numerous lymphocytes, while on the membranes there were collections of epithelioid cells. Within the retina itself were found a few small tubercles composed of epithelioid and giant cells. These were always situated along the walls of veins (fig. 4).

The cornea was normal. On its posterior surface, there were numerous small and large clumps of large mononuclear cells. These seldom contained pigment. The largest clump seen was 0.25 mm. in diameter. The anterior chamber contained a delicate serous coagulum. The iris was adherent to the lens, and the pupil was closed by a delicate membrane arising from its margin. The iris stroma was densely infiltrated with plasma cells, and contained many large nodular collections of lymphocytes, but was free from tubercles. The anterior surface was coated with numerous plasma cells, but was free from nodular precipitates. The filtration angle in most places was open, but in some sections the root of the iris was

firmly adherent to the ligament. In such places there was always a lymphocytic nodule in the root of the iris. Where the angle was open, the ligament was markedly infiltrated with cells—chiefly plasma cells.

The ciliary body was almost free from infiltration, except at the ora serrata, where it was densely infiltrated with lymphocytes. The ciliary processes showed senile hyaline degeneration with obliteration of many of the capillaries. In the posterior part of the pars plana ciliaris retinae, the unpigmented cells were greatly swollen and vacuolated, as is often the case in senile eyes. The vacuoles contained filaments and granules which stained deeply in hematoxylin (mucin?). On the surface of the ciliary body and its processes, plasma cells, lymphocytes and large mononuclear cells were present in small numbers.

The vitreous was slightly infiltrated with serum, and contained numerous lymphocytes and many epithelioid cells. The latter occurred singly and in the form of small tubercles, which were most abundant on the posterior surface of the anterior hyaloid membrane. An occasional isolated giant cell was also seen in the vitreous.

The optic disk was neither cupped nor swollen. Its surface was coated with epithelioid cells, among which there were a few giant cells. Just in front of the

Fig. 5.—Small tubercle within retina, and epithelioid cells on surface of retina. The tubercle is situated beside a small vein which does not show in the illustration. Hematoxylin and eosin stains. Photomicrograph; × 54.

lamina cribrosa, there was an unusually large calcareous concretion. In some sections this extended almost entirely across the disk. The nerve stem showed slight gliosis.

Sections stained for tubercle bacilli failed to show bacilli in the choroidal lesion or elsewhere.

The pathologic diagnosis was localized tuberculous chorioretinitis.

COMMENT

The lesion of the fundus in this case, as seen macroscopically in the enucleated right eye, was typical of that I described and designated as localized chorioretinitis. Since the microscopic examination showed it to be tuberculous, it is logical to assume, exluding syphilis from consideration, that localized chorioretinitis is never produced by any cause other than tuberculosis. Certainly, there is no reliable evidence to the contrary. In my opinion, one microscopic section of a typical lesion is

far more valuable as evidence than all the infected tonsils, tooth roots, accessory sinuses, etc., that have been found in all the cases combined.

In the present case, the left eye was involved also, probably in the same way, except that the choroidal lesion was situated too far in the periphery to be visible. The tendency for the second eye to become involved sooner or later in cases of various intra-ocular infections I have discussed and attempted to explain elsewhere.[1]

While localized chorioretinitis is the most frequent type of choroidal tuberculosis of clinical importance, other types are known to occur, some of which I have examined microscopically.

Elsewhere, I have brought forward experimental [2] and other [3] evidence that in chronic anterior ocular tuberculosis—tuberculous scleritis, keratitis, iritis and cyclitis—the lesions are produced by bacilli which first reach the aqueous and vitreous, and then are deposited on or carried within the various tissues involved. I have also shown experimentally [2] that retinal lesions can be produced in this manner and that choroidal lesions are sometimes produced by bacilli which pass into the subchoroidal space from the filtration angle. In the type of chorioretinitis exemplified by the present case, it seems probable that the lesion results from direct metastasis through the blood, since in this case, with the exception of the vitreous, the anterior part of the eye was free from tuberculous foci. The rather severe iritis was not due to tuberculous infection of the iris itself, but, undoubtedly, to toxin arising from the lesion in the fundus.

The unusually large concretion in the optic disk is of considerable interest, but since it had no apparent relation to the tuberculous process, it need not be discussed here.

It is evident that the primary lesion in the right eye was the large tuberculous focus in the choroid. Probably it began in the choriocapillaris, since the epithelioid cells were confined to the inner half of the choroid. The retina over it became completely necrotic and, therefore, was not invaded by epithelioid or other inflammatory cells. The smaller focus within the periphery of this larger one evidently was more recent and began in the retina, for the retina was here converted into a layer of

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1. Verhoeff, F. H.: Mycosis of the Choroid Following Cataract Extraction, and Metastatic Choroiditis of the Other Eye Producing the Clinical Picture of Sympathetic Uveitis, Arch. Ophth., 1913, p. 517.

2. Verhoeff, F. H.: The Experimental Production of Sclerokeratitis and Chronic Intraocular Tuberculosis, Arch. Ophth., 1913, p. 471.

3. Verhoeff, F. H.: The Histological Findings in a Case of Tuberculous Cyclitis, and a Theory as to the Origin of Tuberculous Scleritis and Keratitis, Tr. Am. Ophth. Soc., 1910, p. 566; Chronic Ocular Tuberculosis: Necropsy Findings in a Case in Which Death was Due to Tuberculosis of the Hypophysis Cerebri, J. A. M. A. **63**:13 (July 4) 1914.

epithelioid cells, while the choroid was infiltrated chiefly with lymphocytes and plasma cells. No doubt it was caused by infected cells which had migrated from the primary focus. The pigmentation of the lesion was produced by migrated cells of the pigment epithelium. Its occurrence in ring form is to be explained by the fact that in the central portion of the lesion the action of the toxin was so intense as to cause necrosis of the pigment cells, while at the periphery it caused proliferation and migration of these cells.

The numerous minute tubercles scattered over the surface of the retina (fig. 5) were no doubt produced by macrophages derived from the primary lesion and deposited on the retina from the vitreous. Probably the white spots sometimes seen around the main lesion in other cases have a similar origin. The tendency for epithelioid cells to accumulate opposite retinal veins was especially notable, and unquestionably explained the formation of tubercles along the veins within the retina. Since these tubercles were identical in appearance and situation with those found in cases of tuberculous periphlebitis retinae, it seems possible that in the latter cases also the retinal tubercles do not arise by direct metastasis through the blood, but are produced by infected cells which have invaded the retina from the vitreous.

IRIDECTOMY IN GLAUCOMA

A STUDY OF THE GLAUCOMATOUS PROCESS *

ALBRECHT VON GRAEFE

BERLIN, GERMANY

The incurability of glaucoma seems to be due to the fact that ocular changes are consecutive and originate from an extra-ocular source, either the optic nerve or the afferent blood vessels. I cannot abandon my belief, stated in my first notes on glaucoma, that arterial atheroma is a factor. The whole question of glaucoma therapy took on a different aspect, however, when I realized that the blindness was to be attributed not to changes in the optic nerve, but to an increase in intra-ocular pressure. The choroiditis either subsides spontaneously or is controlled by the usual therapeutic measures, especially by antiphlogistics. The increased pressure, however, is the main cause of the damage, particularly of the excavation of the optic nerve. As a curative measure I propose that by some means or other a lowering of intra-ocular pressure be effected.

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* Submitted for publication, Nov. 27, 1928.

* Translated by Dr. Francis H. Adler, Philadelphia, from Archiv für Ophthalmologie, 1857, vol. 3.

* It is now seventy-two years since von Graefe published the results of his treatment of glaucoma by iridectomy. There have been few therapeutic measures in ophthalmology or medicine in general which have remained so permanent. The original article, therefore, is not only of great historic value but of practical importance to all ophthalmologists. There are few who do not find iridectomy still the best operative procedure in acute glaucoma.

For those who would know glaucoma, not only in its clinical aspect, but from the point of view of pathologic physiology, the article should be a primer. It is filled with suggestive hypotheses and reveals a keen, critical analysis and understanding of the problem which are truly remarkable for the period in which it was written.

The original article comprised more than a hundred pages. It was translated into English in 1859, appearing in "Selected Monographs of the New Sydenham Society." Since this is not available to everyone, it seemed worth while to make a new greatly abbreviated translation, cast into more modern English. It seemed especially appropriate that this should appear now and in this new journal, for it will be recalled that von Graefe founded one of the best ophthalmologic journals in the world, and during the past year, ophthalmologists universally celebrated the one hundredth anniversary of his birth.

The article was translated in abstract, omitting all protocols of cases, with the idea of adhering to the thought but not the wording of the original, which was verbose. Because of its brevity, it is hoped that the article may stimulate others to read it in the original.—*Francis Heed Adler.* From the Department of Ophthalmology, University of Pennsylvania.

All efforts to produce a rapid outflow of fluid from the eye by general measures failed. Antiphlogistics, diaphoretics, diuretics, laxatives and even a course of mercury to the point of salivation were unsuccessful when employed not only by me but by my colleagues. I then tried local remedies. First, I used the mydriatics. I had pointed out their pressure-reducing action long before and had endeavored to apply them therapeutically in various ways. They did not produce any effect, however, in these cases, even on the accompanying ciliary pain, which yields so quickly to installations of atropine in keratitis and iritis. Probably none, or at any rate, an extremely small amount, of the drug was absorbed through the cornea because of the high intra-ocular pressure.

Finally, I experimented with repeated paracentesis which gave such startling results at first that I published them without hesitation (*Arch. f. Ophth.*, vol. 1). Visual acuity was improved by the outflow of the turbid aqueous and its replacement by transparent fluid. The paracentesis had the great advantage of proving that many symptoms of glaucoma, such as the corneal anesthesia, depended on the rise of pressure. As a result of the paracentesis, I could distinguish the ecchymotic changes in the fundus in the early stages of the disease, since the refractive media cleared immediately. Unfortunately, however, the beneficial results proved only temporary in the vast majority of cases. Of the large number of patients treated by this method, only two were benefited permanently. A woman, about 50, whose eyes showed acute glaucoma, had full visual acuity three years later in spite of atrophic, discolored irises and irregular, dilated pupils. In the second case, that of a man, about 40, the right eye first became glaucomatous and was cured by paracentesis; six months later, the left eye was affected and was cured by iridectomy. In the few eyes which were improved by the operation, visual acuity was not greatly reduced by the inflammatory exudation, in spite of all the initial symptoms of acute glaucoma. In the other cases after a period of improvement of days, weeks and even months, deterioration began, not, as a rule, in the form of a violent inflammation, but as chronic glaucoma. Even when the improvement lasted longer than three months, an unfavorable prognosis could be given because of the gradual constriction of the visual field. I tried to combat these relapses, at first, by methodical repetition of the paracentesis, but each time the therapeutic effect became shorter in duration and finally the vision ceased to improve.

After paracentesis proved insufficient, I began to question whether it was possible to obtain a more permanent reduction of pressure. I knew of the effect of iridectomy in chronic iritis and in different forms of iridochoroiditis, but the conditions in glaucoma were so different that I scarcely hoped for an analogous therapeutic effect. This

operation was really undertaken because of the condition of the iris; in these cases of iridochoroiditis, it was intended to prevent closure of the pupil. The fact that the excision of a piece of iris might reduce the pressure directly did not occur to me.

It was the use of iridectomy in ulcerations and infiltrations of the cornea which led me to the discovery of its pressure-reducing action. Operations for partial staphyloma of the cornea and staphyloma of the sclera usually consisted of an attempt, first, to remove the staphyloma, then to form a new pupil, if this was needed. When I reversed this order for another purpose, I noticed that after an iridectomy the ectatic part frequently receded to the normal level of the cornea, and that the second operation was unnecessary. In fact I saw cases in which repeated attempts to correct the staphyloma failed until an iridectomy was performed.

I first saw that iridectomy caused a complete and permanent regression of the ectatic parts in blind eyes with multiple staphyloma; later I achieved the same results, under similar conditions, in eyes which still possessed vision.

The question then arose as to whether an iridectomy would reduce tension, not only under certain pathologic conditions, but in a normal eye as well. I believe I can answer this in the affirmative, although I have not yet attempted a direct experiment. The eyes of animals in which I excised large pieces of iris usually seemed slightly softer. When the needle of an Anel syringe was carefully inserted into the anterior chamber of such an eye, the aqueous did not rise to the normal height in the tube due to the intra-ocular pressure. Further, in eyes in which a new pupil was formed because of an adherent leukoma a slight permanent decrease in tension seemed to occur.

Fortified by these facts and hypotheses I felt justified in performing an iridectomy in glaucoma. I knew the favorable effect of the operation on the choroidal circulation. Everything seemed to promise that the operation might have a physiologic and a therapeutic effect in lowering pressure. The first attempts varied extremely, since I had no criteria for the choice of cases or for the details of the operation. I began to use this method in June, 1856, and from that time applied it in cases of acute glaucoma. The immediate effect appeared favorable, but recalling my disappointment with paracentesis, I was extremely mistrustful. A continuous improvement became apparent, however, as the observations were prolonged. The signs of glaucoma gradually disappeared. After observing a few of the patients for more than a year and many of them for more than nine months, I believe the operation of iridectomy to be a curative measure to combat glaucoma. Naturally, this therapeutic measure, like all others, has its limitations. To define these is my purpose in this article.

IRIDECTOMY IN THE PRODROMAL STAGES OF GLAUCOMA

It is not often that patients seek medical assistance when prodromal symptoms of glaucoma appear in the first eye affected; these are either overlooked or regarded as of little importance. On the other hand, it often happens that after the vision in one eye has been lost from glaucoma, the patient is alarmed by prodromal symptoms in the other eye. The question then arises as to whether one should await the distinct outbreak of the disease in the other eye or should interfere during the prodromal stage. I hesitated a long time before doing the latter, because vision was still good intermittently, and because I lacked complete confidence in the procedure. As I gradually became bolder, I began to operate in a few cases during the prodromal period, and was entirely satisfied with the results. Loss of vision did not occur in a single case following iridectomy. The ciliary pain and colored halos disappeared. The periodic clouding of the aqueous also vanished and did not return. The anterior chamber appeared deeper than before. I could not decide whether or not a slight decrease in presbyopia occurred. In three of these cases, clouding of the vision had occurred rather frequently for several months before the operation. For this reason the effect seemed to be permanent. Visual acuity is as little influenced as is the accommodation by the presence of a moderately broad coloboma. Moreover, the possible small changes in this respect, contrasted with the certainty of complete blindness, are not worthy of consideration.

Such an early choice of iridectomy naturally has its rational limits. If the prodromal symptoms are limited to pain in the forehead and temples and to colored halos, without reduction in vision, and if these symptoms return at intervals of several months and the eye finally does not show any sign of disease, I should not advise an operation, since this condition may last for many years.

There cannot be any disadvantage in temporizing and in using internal medication. Any operation, however safe, may harm the patient accidentally or as a result of his disobedience. I usually advise patients in whom one eye is blinded from glaucoma and the other eye is threatened to submit to an operation when the prodromal symptoms appear in the second eye, especially if diminution of vision occurs. One should not wait for a severe inflammatory attack. Even if an iridectomy affords complete relief from symptoms during the acute stage, the whole management of the patient at this time demands greater care and caution, and the operation itself is more painful. Massive retinal hemorrhages may occur making the restoration of vision slower. Changes in the iris, fixed pupils and paralysis of accommodation usually continue. The prodromal stage may never pass into the acute form but may develop gradually into the chronic form through the continuous pro-

traction of the exacerbations. The disease may not assume an inflammatory character, or at least not until complete restoration of vision is impossible.

The performance of iridectomy in the prodromal stages of any case of glaucoma gives a relatively favorable prognosis. Retinal hemorrhages occur at times after the operation but to a much smaller degree, and massive hemorrhages never occur in the aqueous or the vitreous even without a pressure bandage. If iridectomy were of service only in maintaining vision in the second eye after blindness occurred in the first, it would be regarded gratefully, I believe, for these cases are exceptionally depressing for the sympathetic practitioner, who formerly was unable to prevent blindness. It is a pity that the successful application of iridectomy should be limited to the smallest group of patients with glaucoma, since in many cases a prodromal stage does not exist, and the majority of patients seek medical help only during the subsequent period.

Even when the prodromal symptoms have lasted a long time, iridectomy gives the same result. In this connection, I might mention a patient whom I treated for two years. One eye had been blinded by glaucoma and the second was in the prodromal stage. The periodic obscuration of vision became more frequent and more intense and I knew of no means to check the glaucomatous process. I gave, therefore, the most pessimistic prognosis and sent the patient home. About nine months ago one of my assistants, Dr. Alfred Graefe, performed an iridectomy on this patient, with splendid results. The reduction in visual acuity in the meantime, however, had become severe.

IRIDECTOMY IN THE ACUTE PERIOD OF INFLAMMATORY GLAUCOMA

My experiences are far more numerous in cases during the acute period of inflammatory glaucoma than in those during the prodromal stage. I operated on more than twenty eyes shortly after the outbreak of the first marked inflammation which, in a few cases, was so severe that an operation seemed disastrous from the start. These patients had the most violent ciliary pain, marked chemosis, tears, photophobia—in short, an extreme arthritic ophthalmia.

I sought, at first, to alleviate the symptoms by antiphlogistics, opiates and similar treatment. I became convinced, however, that immediate iridectomy was necessary. Under these conditions every delay causes increased damage, and the surest help for the inflammation lies in the operation itself. After the operation not only did the symptoms improve without other means of treatment, but a rapid clearing of the refractive media occurred in every case. Seven days after the operation, the

eyeground could be seen clearly with the ophthalmoscope. I thus ascertained the following facts about the process which later were of considerable aid:

1. The optic nerve is entirely normal after the first attack. Cupping or displacement of the vessels is not present, provided that chronic glaucoma has not preceded the attack but that the disease has occurred in a normal eye or after an intermittent prodromal period.

2. The same condition exists in respect to the arterial pulse.

3. The punctate hemorrhages in the retina are present constantly, but, undoubtedly, most of these occur after the operation.

4. In a careful observation of the equatorial region frequent choroidal hemorrhages are seen. These disappear quickly, however. It is not yet clear whether their inconstancy is not due entirely to the time of observation, since I have discovered them several times prior to operation.

Visual acuity as a rule improves immediately after the operation. This seems to depend, as in the case of paracentesis, on the outflow of the turbid aqueous. The degree of improvement, however, is not considerable when compared with the subsequent improvement, which may be explained partially as the clearing of the ocular media. In my opinion, however, this improvement results more from the resumption of the retinal functions which have been depressed by the intra-ocular pressure.

It is easy to disprove the hypothesis that the improvement depends entirely on the clearing of the refractive media. I refer, for example, to the case of Gause. Before the operation even the perception of light was gone; yet the outline of the optic papilla could be seen clearly with the ophthalmoscope. This patient should have been able to recognize large objects. Five days after the operation there was considerable blood in the anterior chamber of the eye, so that the fundus was more hazy than before the operation; yet the patient now could count fingers at a distance of 4 feet.

There does not seem to be a direct relationship between the clearing of the refractive media and the restoration of visual acuity. The turbidity, however, is indirectly linked with an increased formation of fluid, which is due to the persistence of the choroiditis and the increase of intra-ocular pressure. The main effect on visual acuity occurs from two to three weeks later. By this time, the congestion of the eye usually has subsided. The cornea again becomes sensitive, in these cases but not in the older cases, apparently because of structural changes in the afferent nerves, making them incapable of restitution. The ciliary pain ceases immediately after the operation. On rare occasions, patients

have pain in the forehead for the first few days, or complain of a slight sensation of the wound which is different from the other pain.

The condition of the iris varies according to the degree of involvement. I have never seen a completely movable, normal iris once marked inflammation has occurred. Partial mobility is found frequently, but in the majority of cases the pupil remains completely paretic although not as dilated as before. Occasionally the pupil is somewhat narrower than normal, with due allowance for the coloboma. The irregular form and position of the pupil seldom disappear even if posterior synechia are not present. This may be attributed to an irregular distribution of the paralysis of the ciliary nerves. Hence, it is a question whether the permanence of the pupillary damage is due to structural changes in the iris itself or to changes in the ciliary nerves. It is difficult to decide this, but I am rather inclined to the first opinion. The iris never regains its normal appearance in well marked cases. An ashy gray discoloration remains, as well as an indistinctness of the trabeculae, either in spots or in large areas, especially toward the periphery. This fact, which affords ample evidence of the disease, is important in the later recognition of the case. The tension of the globe returns entirely to normal; in fact, in some cases the eyes seem a trifle softer after operation than before.

The restoration of vision within two or three weeks is striking. From this time on, a further slight continuous improvement occurs, so that by the end of six weeks, visual acuity may have reached its full normal value. This improvement, in my opinion, seems to be connected with the absorption of the retinal hemorrhages. The smaller of these hemorrhages do not cause any considerable impairment, when they are eccentric; the larger, on the other hand, diminish the acuity of peripheral vision in certain parts of the visual field, causing scotomas. Occasionally, the macula lutea is also affected. In these cases central vision naturally is greatly impaired. The occurrence of eccentric fixation in one case would have caused me considerable anxiety if the ophthalmoscope had not demonstrated a large central hemorrhage and later confirmed my belief that after absorption of the hemorrhages the retina would again function. In from six to eight weeks the last trace of the retinal hemorrhages vanished.

Similar results occurred in all the cases of glaucoma with the exception of one in which the retina behaved differently after the iridectomy. Repeated fresh retinal hemorrhages occurred although the exterior of the eye was all that could be wished for. Finally, white plaques, similar to those seen in albuminuria, were deposited around these hemorrhages. In fact, an examination of the urine at a later period showed albumin. This case must be excluded from the series,

but it is interesting, since the retinal hemorrhages following the iridectomy were the cause of a degeneration of the retina arising, apparently, in connection with disease of the kidneys.

In all the cases in which operation was performed within two weeks after the beginning of the inflammation, a complete restoration of vision occurred. The patients in several of these cases seemed desperate, having lost every trace of the perception of light. It is hardly necessary to add that I offered them little hope. I merely undertook the operation because of the violent ciliary pain. The result, however, was truly astounding. For the last half year I have predicted the complete return of function, provided that less than two weeks have elapsed since the beginning of the inflammation and that some perception of light still exists. My early anxiety that the results might not be permanent gradually vanished. The visual field remained absolutely normal. Eccentric vision maintained its acuity once it had returned to the previous level. Not the slightest prodromal symptom recurred. The congestion of the subconjunctival vessels disappeared entirely; the anterior chamber became deeper and nothing betrayed an abnormal condition of the eye except the discoloration of the iris and the inactivity or paresis of the pupil. I cannot absolutely allay fear of a recurrence because of the short duration of my observations. It is certain, however, that a similar inhibition of the glaucomatous process has never occurred spontaneously or after any other form of treatment.

Accurate observation of the so-called period of remission of inflammatory glaucoma gives a different picture, especially in the functional tests. Many of the patients operated on have been under observation for about a year, and so far I have not had to correct my previous statements. Regardless of the final outcome, I believe that those who know the usual course of acute glaucoma will adopt this procedure from the foregoing facts.

In spite of the surprising results of iridectomy shortly after the beginning of the inflammation, an exact analysis of the facts shows the correctness of the argument in favor of operating during the prodromal state. I would call special attention to the relative danger of the operation during the two periods. In the prodromal stage a chance accident seldom occurs even when the operation is not performed correctly. In the acute period, on the other hand, with every precaution, the result may be disappointing because of retinal hemorrhages and other adverse conditions which may occur in isolated cases in spite of the greatest care. This can be decided only after comprehensive statistics are gathered.

Where must the line be drawn then between cases of long and those of short duration? This question must be answered arbitrarily since

distinguishing signs or symptoms do not occur during the later course of the disease. It is best to call those cases recent in which contraction of the visual field or cupping of the nerve is not shown. Unfortunately, these two signs are extremely difficult to determine during the inflammatory period. The haziness of the refractive media makes observation of the papilla difficult, and the determination of the visual field is impossible when only perception of light is present. For the purpose of this paper, therefore, an arbitrary time limit was set up. All so-called recent cases must have come under observation within fourteen days after the first inflammatory outbreak. In all these cases, cupping of the optic nerve did not occur later. I doubt if there was any transitory disturbance of the optic nerve during the inflammation, since a case apparently did not occur in which an excavation vanished after iridectomy. The perception of light which was present in one case was distributed throughout the whole visual field and could not be explained simply by the diffusion of light.

Observation of these patients showed that iridectomy does not influence the second eye. Frequently the process starts in the second eye after the first has completely recovered. It can be said with certainty that the glaucomatous inflammation of the second eye does not arise sympathetically from the disease of the first eye.

IRIDECTOMY IN THE LATER PERIODS OF ACUTE GLAUCOMA

Although the curative value of iridectomy is most marked in cases of short duration, it loses none of its importance in disease of longer standing. My observations in this group are even more numerous than in the others. Because of variability of the results, however, their final evaluation has been more difficult, and a continuation of these studies is necessary. The following is only a preliminary report:

1. A lapse of weeks or even months after the first glaucomatous attack does not prevent complete restoration of sight; this depends entirely on the characteristics of the individual case. Occasionally, the first inflammatory symptoms are intense, but the acuity, visual fields and optic papilla may remain normal for a long time in spite of iridoplegia and discoloration of the iris. These are the cases in which the actual beginning of the disease is not sharply defined from the prodromal period. In these cases iridectomy can effect a complete recovery many months after the outbreak. Even though the visual field and optic papilla are normal during the remissions, central vision may be considerably reduced. The cure seems to be just as permanent here as in the initial period. In malignant cases, as early as a few weeks after the first attack, conditions may be much more unfavorable for operating; in fact, there are fulminating cases in which vision is destroyed forever, so that after the first few weeks nothing is of avail.

2. The prognosis is different as soon as the visual field is constricted. A moderate concentric contraction is the most favorable. It occurs far less frequently, however, than a marked constriction coming in from one side; the latter affects the prognosis the more it approaches the midline. The condition of the papilla is equally important. When the papilla is but little cupped and, on the other hand, the field is decidedly cut down, there is naturally only slight improvement. This is particularly true of the visual acuity but also applies to changes in the field which occasionally may increase four-fold. The improvement usually continues. If, on the other hand, well marked cupping is associated with a high degree of contraction of the field, which is unfortunately the most frequent condition, a warning against too hasty an optimism is hardly necessary.

Once the cause is removed, the progress of the disease seems to depend on indeterminate factors in the affected optic nerve. The immediate results of the operation are favorable in most of these cases also. In many there is not only improvement in central vision but also a widening of the visual field. This improvement, however, seems to be permanent only in certain cases. In others, vision later deteriorates. A long period of observation is needed for one to determine the end-results, but it can be said now that the effectiveness of the operation often disappears completely if there is a beginning excavation. In spite of this fact, some patients remain encouraged, and iridectomy offers more hope than any other treatment, even though it frequently is only a delay in the approach of blindness. If the visual field is decidedly eccentric, improvement cannot be expected. This applies more to the later stages of acute glaucoma than to chronic glaucoma. An arrest of the rapidly progressive form may occur occasionally, but I believe this is always temporary. When all perception of light is lost, recovery of vision does not occur.

3. Tension of the globe, iridoplegia, corneal anesthesia and shallowing of the anterior chamber are favorable in that they prove the reduction in vision to be attributed partly to increased pressure, on which iridectomy has a beneficial action. This is also true of clouding of the aqueous and vitreous.

4. If the improvement in an advanced case of glaucoma is not permanent following iridectomy, the decrease in vision is not accompanied by symptoms of a fresh glaucomatous choroiditis. One should not speak, therefore, of a recrudescence of the original disease. It appears more similar to a progressive amaurosis with contraction of the visual fields; the substance of the optic nerve becomes paler and less transparent, the arteria centralis narrower, and in some cases the excavation seems to increase. Since changes in the internal membranes, opacities

of the refractive media and symptoms of an increase in pressure cannot be discovered, the blindness must be caused by a continuation of the disease in the optic nerve.

In a few cases which are exceptional, the subsequent deterioration occurs with symptoms of a rise of pressure. This was so in the case of Madame Sack of Vienna, a woman, about 40 years of age, whose eyes had been afflicted for several months. In both eyes the optic nerves were considerably cupped; on the left there was only an eccentric visual field, and the right field was somewhat narrowed. Moderate vision was still present. The symptoms of increased pressure were so distinct and resistant that the coloboma made at one iridectomy had to be enlarged during a second operation. At first there seemed to be improvement, as in the other cases. Six weeks later the subconjunctival veins were congested, the cornea became insensitive, the pupil dilated, the retinal veins filled and became tortuous, the cup deepened, vision decreased and the field contracted. Again there was a picture of chronic glaucoma. This is the only case I saw in which the deterioration depended on an actual recrudescence of the glaucomatous process. I believe that a still wider excision of the iris would have given better results.

5. In all cases of glaucomatous blindness an iridectomy has the advantage of alleviating the existing inflammation and the ciliary pain. The ophthalmologist who knows the torture which these blind eyes cause patients for years will greet the effect of iridectomy most heartily. Treatment with frequent blood-letting and narcotics is not necessary any longer. It is known now that during the later course of the glaucomatous process anesthesia of the cornea caused softening and ulceration. An iridectomy is of value in this condition also, partly by restoring the conductivity of the corneal nerves, and partly by lowering the intraocular pressure with a favorable effect on the corneal infiltration.

IRIDECTOMY AND CHRONIC GLAUCOMA

Although it was on patients with chronic glaucoma that I first performed iridectomy, I yet cannot pass final judgment on this method of treatment in this group. In my notes I find mention of cases in which there was considerable improvement for three months after the operation, followed by deterioration. I am convinced, therefore, that extreme caution should be exercised in pronouncing a patient cured permanently. I can say without hesitation that iridectomy also exerts a temporary favorable effect in chronic glaucoma; the degree and permanence depend on the circumstances. Since the therapeutic value of the operation in any case exceeds that of all other remedies that have been tried, it is clearly necessary to continue to multiply the observations. It is hoped that my colleagues will aid in this effort.

The prognosis in general seems to depend on the same factors in these cases as in the later stages of acute glaucoma. Contraction of the visual field and excavation of the optic nerve mar the prognosis but do not necessarily make the condition hopeless. In fact, it is my experience that contraction of the visual field in chronic glaucoma is less unfavorable than in the acute form. Even when there were well developed eccentric and slit formed fields I noted considerable improvement. In general, a rather early cupping is unfavorable; hence, an extremely early diagnosis is of essential importance. This is not made as easily as in acute glaucoma, in which at the first inflammatory attack an iridoplegia can be discerned easily. In this condition, the other symptoms may be limited for a long time to a delicate haziness of the aqueous, sluggishness of the pupil and slight shallowing of the anterior chamber. Even at this stage the disease of the optic nerve may be present. The more indicative the symptoms are of an increase in pressure at the time of operation, the more one can expect from an iridectomy. The duration of the disease should not influence the prognosis. In a case of several years' standing, I have seen significant improvement which still persists. The eye may lose its glaucomatous appearance; the refractive media may become clear again; the tension may return to normal, and the ciliary pain that was present may disappear. Retinal hemorrhages are present as a rule but to a less extent than in acute glaucoma. The changes in the texture of the iris are much fewer than in the acute form of the disease. The pupil is constricted and frequently regains a moderate amount of movement which can be attributed to the smaller involvement of the iris. Once cupping of the optic nerve occurs, it never disappears.

IRIDECTOMY IN AMAUROSIS WITH CUPPING OF THE OPTIC NERVE

The following cases belong, I believe, to a different category from that of true glaucoma, and it may seem inexplicable that iridectomy should have been tried. There were two reasons. First, it was thought that arguments might be found for or against the foregoing views on the value of iridectomy. Of course, an out-and-out direct use of iridectomy for relief from pressure would not have any value in cases of primary disease of the optic nerve. The constant exposure of the optic nerve, however, to the intra-ocular pressure might affect the metabolism of the nerve, thus infiuencing the development of the disease. A diminution of the pressure below the normal level would hardly be favorable, of course. If the substance of the optic nerve were damaged, the papilla might yield even to the normal pressure. If the original process were still amenable to treatment, the ectatic form of the papilla might hinder the resumption of function.

I have never observed any direct curative value of iridectomy in these cases. I have never seen improvement of visual acuity or widening of the visual fields beyond the limits of error in observation. Although it is a dark chapter in the therapy, iridectomy has been of value in separating this group of cases from those of true glaucoma.

Another question is this: Do the cases of progressive amaurosis with cupping of the optic nerve proceed less rapidly after an iridectomy, on the presumption that the diminution of intra-ocular pressure aids the healing of the disease of the optic nerve? My observations on this point for several years have not convinced me that this is the case. Spontaneous changes in these cases are so slow that they can scarcely be recognized in a period of from three to six months; further, an actual cessation of the process occurs without other curative measures.

Concerning the operative procedure itself, I have little to say. A piece of iris is excised as in operations in which an artificial pupil is formed. The following points should be observed:

1. The wound must be as eccentric as possible so that the point of entrance is about one-half a line out in the sclera and the internal wound just at the limbus. In this way it is possible to draw out the iris up to the point of its ciliary insertion; this seems to be necessary for a good result. Any deviation of the internal wound from the limbus will diminish the size of the coloboma considerably.

2. Since the excised piece must be as large as possible, a broad, lance-shaped knife should be used, or the usual knife must be thrust in rather deeply. The operation differs, therefore, from that for the formation of an artificial pupil, in which one should excise only a medium-sized piece of iris for optical reasons. The more severe the symptoms and the higher the tension, the more iris would I advise being excised. There is little choice as to the site of the operation. I usually make my incision toward the nasal side; if the cosmetic effect is considered on account of the age of the patient, the incision can be made above this area, although I find that the colobomas made to the nasal side are scarcely noticeable in dark eyes. The excision above is rather difficult and demands a greater rotation of the globe with the ophthalmostat, perhaps producing a greater inflammation.

3. The aqueous must be evacuated carefully, because too sudden a release of the pressure may cause numerous hemorrhages. In glaucoma, however, these massive hemorrhages tend to occur less frequently than in cases of iridochoroiditis with atrophy of the globe, probably because of the relatively greater pressure after the escape of the aqueous. On the other hand, from the very nature of the disease there is a disposition to rupture the blood vessels. Whether this is due to direct involvement of the wall of the vessel or to venous stasis, I cannot say.

I have noted the presence of retinal hemorrhages many times. During the outflow of aqueous I usually exert slight pressure with the finger on the globe. A compression bandage is put on immediately after the operation, and loosened a few hours later. I have not found any other after-treatment necessary. Even when the operation is undertaken at the peak of the inflammation, the symptoms subside spontaneously. It may be necessary in exceptional conditions to apply some antiphlogistic remedy in order to hasten the subsidence of the inflammation. Naturally in these cases the eyes must be more protected from the light and the usual precautions more strictly observed than in the ordinary operation for an artificial pupil.

The curative effect of any local measure in glaucoma and the permanence of the cure, at least in certain cases, might lead one to conclude that the disease is essentially local and that the supposition which I and others have advanced, that a disease of the blood vessels is the primary noxious agent, is incorrect. Although this hypothesis is somewhat weakened by the results of iridectomy, no conclusions should be drawn at this time. Changes in the vessels may cause an anomaly in the circulation which does not disturb the function of the inner parts of the eye until some local factor is added. After a change in the local circulation the primary cause may continue without producing the earlier effect. When therapy in general is considered, it is often found that a cure frequently does not consist in a removal of the cause but in a removal of certain associated factors. If the statements concerning the action of iridectomy are summed up, the following facts appear:

1. The surest results are obtained in those cases in which one eye is threatened after the other has become blind. In such cases it is the duty of the physician to refer the patient as soon as possible to an oculist for strict observation, and, vice versa, it is the duty of the oculist to warn the family physician to look for those symptoms which call for operative intervention.

2. Once the glaucomatous process has set in, the results are the more favorable and permanent the earlier the operation is performed. In the acute cases in which vision is lost almost immediately, iridectomy must be performed whenever possible in the first few days of the disease. This is of the utmost importance. As the transportation of the patient in this condition is extremely difficult, it is desirable that every physician, especially those in the country and in the smaller cities in which ophthalmology is not practiced as a specialty, should make himself thoroughly familiar with the symptomatology of glaucoma and with the technic of iridectomy. Of the two, I believe that the latter is the easier to acquire. Even a good assistant may be dispensed with more easily when an iridectomy is performed than when many other

surgical procedures are done; for example, tracheotomy, which every physician must perform occasionally in an urgent case under the most unfavorable conditions. Iridectomy thus differs from other ophthalmic operations, since the indications for these are so rarely urgent that they are usually performed only by the relatively small number of physicians who have the required skill and experience. As science advances, the demands made on physicians must necessarily change. Previously a glaucomatous eye was considered incurable the moment the diagnosis was made. It was comparatively unimportant, therefore, which type of medical treatment was used and whether this was instituted relatively early or late. A physician never had to reproach himself for delay in this respect. If I am not mistaken, conditions now are changed. An eye which has been blinded from acute glaucoma may as well excite suspicion of neglect as a badly set fracture, or atresia pupillae following simple iritis.

3. It has been shown that iridectomy is not suitable for all stages of the disease but that its action in a later stage, at least in some cases, is extremely uncertain. It is sad to see the number of incurably blind persons who make long journeys because they think their disease is still curable. Those patients who have long been blind should, if possible, forego an operation and thus spare the surgeon many hours of regret. Certainly only moderate hope should be extended to those whose disease is of long standing and who have but little sight and a contracted field of vision.

I am aware of the incompleteness of these results even from a purely empiric point of view. The number of trials cannot be too great; the results cannot be followed for too long a period, and the observations cannot be too exact or too conscientiously carried out. The further the work progresses, the more I am convinced how much remains to be done and how insufficient is the experience of one man. The theory of the curative effect of iridectomy is far less certain than the empirical fact.

I adopted this treatment with the idea of diminishing the intra-ocular pressure. Pursuit of this point of view seems to have obtained a result. At the same time, this is not a proof of the correctness of the explanation. It is possible that the effect of iridectomy is extremely complex. A decrease in the secreting surface of the iris might account for a reduction in the quantity of the fluid, but as yet information is lacking as to how much less aqueous is secreted in these cases and whether such a deficiency could explain such a striking change in intra-ocular pressure. The cooperative effect of the muscles of the iris with the tensor choroidea, which was pointed out in a recent theory of accommodation, might explain how the excision of a piece of iris would produce a diminution of intra-ocular pressure by a relaxation of this

muscle. The persistence of accommodation after the coloboma has been made, however, does not support this view. Perhaps interference with the iris acts primarily on the choroidal circulation, the therapeutic pressure-reducing effect being only secondary. The presence of the hemorrhages proves that iridectomy in glaucoma is of considerable influence on the ocular circulation. The treatment, undoubtedly, will be still more efficacious when ophthalmologists are able to analyze more correctly all the foregoing points. It is conceivable that in selected cases the ordinary excision is not sufficient, but that removal of larger pieces of iris will make the operation more successful. As already stated, the pieces of iris should be larger in proportion as the case is more severe.

The whole subject of glaucoma is open to the most varied investigations. After the marked change in our views on glaucoma produced by the first ophthalmoscopic examinations, I felt that further investigation was imperative. The difficulties which I encountered are apparent to any unprejudiced reader. I hope that I have assisted in solving some of these and that some one who is better equipped than I will soon bring this difficult task to a more happy conclusion.

ULCERATION OF THE SCLERA*

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Although scleritis or inflammatory infiltration of the sclera is common, idiopathic scleral ulcer is rare. Sichel,[1] in 1857, first called attention to the great rarity of scleral ulceration. Hirschler,[2] in 1850, was probably the first observer to report this condition. In his case, an ulceration of the sclera, about 1 mm. in width, was situated in the upper temporal quadrant near the cornea. The ulceration had penetrated to the choroid.

Pfuhl,[3] in 1867, observed a deep scleral ulcer, 3 mm. broad, above and temporally near the limbus in a girl, aged 18, with scrofula. In addition, two smaller ulcers were present nearby in the same sclera, and another in the sclera of the other eye on the upper inner side near the limbus.

In 1874, Hirschberg[4] reported the case of a man, aged 46, who presented a deep crateriform ulcer, 1.5 mm. in diameter, with a white floor, in the sclera near the limbus in the lower inner quadrant of the left eye. The mode of treatment was not reported; however, healing was steady but slow. Hirschberg also observed a pointed prolapse of the ciliary body in two other long-standing cases of scleritis, with a circular and irregularly colored scleral cicatrix and poor vision.

Saemisch,[5] in 1876, observed a scleral ulcer in a boy, aged 10, after an attack of measles. The defect was about 4 mm. in diameter, and through it a sound could be passed into the interior of the globe. The entire conjunctiva was covered with spongy granulations which bled readily and produced a mucopurulent secretion. A slight shrinking of the eyeball resulted.

Darbishire,[6] in 1878, treated, a child, aged 5 years, suffering from a feverish disease of the lung and pemphigus. In the right eye, there were found three round perforations of the sclera which first appeared as the general condition of the patient began to improve. The perforations gradually disappeared without disturbing the form or function of the eye.

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1. Sichel: Arch. f. Ophth. **3**:226, 1857.
2. Hirschler: Pest. Ztschr., 1850, p. 24.
3. Pfuhl: Inaug. Diss., Berlin, 1867.
4. Hirschberg: Klinische Beobachtungen, 1874, p. 30.
5. Saemisch: Handb. d. ges. Augenh., 1876, p. 327.
6. Darbishire: St. Barth. Hosp. Rep. **13**:279, 1877.

A large scrofulous ulcer of the sclera with exceptionally thick edges was observed by Pardo [7] in a 7 year old child. The eye turned in, because the ulcer had involved the external rectus muscle. The ulcer finally healed completely after a lengthy local and general course of treatment.

Holthouse [8] reported the case of a woman, aged 71, who had suffered for one year from rheumatism. Two episcleral swellings near the cornea were present in the right eye, and one in the left. All except the one on the inner side of the right eye disappeared after weeks of treatment with sodium salicylate internally and yellow mercuric oxide ointment locally. This swelling increased in size and ulcerated, and later the eyeball shrank and was enucleated because of constant pain. Pathologic examination by Treacher Collins revealed a break in continuity of the sclera and cornea extending through the ciliary body. This gap was filled with a mass of inflammatory cells continuous with that infiltrating the shrunken vitreous and also with some situated between the iris and lens capsule.

A factory worker, aged 23, with a marked scrofulous habitus was observed by Geise [9] in 1897. On the sclera, near the temporal limbus of the right eye, were two grayish-white, elevated, round areas, 4 mm. in diameter, which were not covered with conjunctiva and were probably large phlyctenules. One application of galvanocautery led to progressive improvement.

Rönne,[10] in 1908, observed a deep ulceration of the sclera, 5 mm. from the corneoscleral margin, in the upper inner quadrant of the right eye of a married woman, aged 28. The width of the ulceration was from 1.5 to 2 mm., the edges were perpendicular and nearly undermined and the floor was a dense yellowish white. Surrounding the ulceration, was a flat, reddish-brown infiltration of the scleral and episcleral tissues, with many dilated superficial and deep blood vessels. In the same person, the sclera in the upper outer quadrant of the left eye showed a flat, sharply elevated scleral infiltration, containing in several places yellowish, deep-lying centers which apparently were necrotic. A few days later, the largest of the yellow nodules ulcerated, later showing a deep, sharply circumscribed crater, 2 mm. in diameter. Under local treatment with potassium iodide and acetylsalicylic acid, both ulcerations healed in a few weeks. The author did not think syphilis or tuberculosis was the cause.

Again, in 1911, Rönne [11] mentioned the case of a woman, aged 35, in whom there developed, in a right-sided scleritis near the upper corneal

7. Pardo, E.: Riv. clin., 1880, p. 338.
8. Holthouse, Roy. Lond. Ophth. Hosp. Rep. **13**:415, 1893.
9. Geise: Klin. Monatsbl. f. Augenh. **36**:201, 1898.
10. Rönne: Klin. Monatsbl. f. Augenh. **46**: 522, 1908.
11. Rönne: Ophthalmology **7**: 233, 1911.

Ulceration of the sclera.

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margin, several yellowish nodules, and later three ulcerations, 0.5 mm. in diameter, within them. Microscopic examination of an excised nonulcerated nodule revealed a circumscribed dense heap of lymphocytes and plasma cells in the subconjunctival tissue.

Collomb [12] stated that as the rare tuberculous involvement of the sclera must be metastatic through the blood, it should occur in the two localities in which vascularization is greatest, that is, around the optic nerve and around the limbus. Collomb quoted Fietta who, in 1911, made an extensive study of the literature on scleral tuberculosis. Thirteen cases of true tuberculosis of the sclera were found, of which ten were present in the most anterior portion of the sclera near the limbus, and the other three in the posterior part in the immediate vicinity of the optic nerve. The clinical appearance of that process involving the anterior portion of the sclera was always remarkably uniform—a swelling more or less rounded, from 5 to 10 mm. in diameter, projected only a little and grayish yellow or rose colored; frequently there was a tendency toward ulceration. The anterior scleral tuberculoma may be considered relatively benign and curable.

Chaillous and Nida [13] reported the case of a man, aged 62, who presented in the left eye a large ulceration, with a white necrotic floor, involving the conjunctiva of the inferior fornix and the adjoining sclera. Vision was lacking; the anterior chamber was abolished, the iris was atrophied and the pupil was secluded, indicating through the blood of the uveal tract the probability of a tuberculous involvement.

I have compiled the foregoing brief summary from all the material obtainable in the literature bearing on the subject of ulcer of the sclera. My attention was first called to this condition less than a year ago when I was asked to see the following patient in consultation with a physician in an adjoining town.

REPORT OF CASES

A boy, aged 10, had been under treatment for a number of weeks. At the time I saw him, he presented the following condition: a large ulcerated area on the temporal side of the the left eye, extending from near the limbus to the equator, the bottom of which was covered by a necrotic purulent mass and surrounded at its edges by granulation tissue piled high above the level of the sclera. When the ulcer was washed clean of the débris, the ulcer seemed in imminent danger of perforating in a number of places. He did not complain of any pain, and said he had had none. His vision was unimpaired, the media was clear and the fundus did not show any changes.

As this patient presented some of the stigmas of congenital syphilis, especially as to his teeth, a vigorous course of antisyphilitic treatment was suggested (without waiting for the report on a Wassermann test of the blood), together with

12. Collomb: Rev. gén. d'opht. **34**:253, 1920.
13. Chaillous and Nida: Bull. Soc. d'opht. de Paris, 1927, p. 209.

suitable local treatment. He did not appear for examination again, but I was told that he gave a four plus Wassermann reaction, and that the condition cleared up rather promptly without any loss of function.

A second case came under observation on Dec. 10, 1927.

Mrs. A. L., aged 35, had several healthy children and no history of illness. Two weeks before, she noticed a small red spot on the conjunctiva of the right eye, which continued to grow worse, accompanied with increasing pain.

At the time of her first visit, a small ulcer was seen on the conjunctiva, about 3 cm. beyond the temporal limbus; the excavation was about 3 mm. in diameter, the bottom of which seemed to be covered with necrotic tissue firmly attached to the base of the ulcer; the ulcer was surrounded by a deeply infiltrated elevated area. A general physical examination, including the teeth, tonsils and sinuses, did not reveal any focus of infection, and a Wassermann test of the blood was negative. After a few days, treatment consisting of antiseptics and touching the ulcer with tincture of iodine was administered; the pain, in spite of the salicylates and acetylsalicylic acid continued to be severe, the patient was sent to Dr. D. R. Lamb for examination as to the possibility of a tuberculous infection. He reported a normal chest, lungs and heart.

An intracutaneous tuberculin test was then given with graduated strengths of old tuberculin. With 0.00001 mg., there was no reaction; with 0.0001 mg., there was a fairly positive reaction, with redness and swelling over a diameter of ¾ inch (1.9 cm.); with 0.001 mg. there was a definite reaction over an area 1½ inches (3.8 cm.) in diameter. The reactions were evident about eight hours after the tests were done, and coincident with them there was a local reaction in the affected eye, manifested by increased redness and some increase of pain. Within two weeks after the injections of tuberculin were made, the condition of the eye was quiescent, there was no pain and the entire area was covered by conjunctiva, although the area had not filled out; a facet corresponding in size to the original ulcer remained. The patient did not appear for further observation.

From a study of the literature, it would seem that scleral ulcer is the result of deep seated infections such as tuberculosis and syphilis and not focal infections of teeth, tonsils, sinuses, etc. This statement is further borne out by the two cases reported here.

Ophthalmologic Review

THE ENTOPTIC VISIBILITY OF THE CAPILLARY CIRCULATION IN THE RETINA*

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It is a matter of common experience that if one looks at a brightly illuminated surface like the sky, small dancing spots can be seen. These usually appear as bright circles against a somewhat darker background; occasionally, the shape is more oval, and one side is brighter than the other. In every case, these spots are highly motile and pursue more or less definite paths, which are usually short and somewhat curved.

This phenomenon was first described by Boissier de Sauvages [1] in 1763, and was thought by him to have some connection with the circulation of blood in the retina. In 1813, Steinbuch [2] likewise gave a good description of the movements which he noticed when he looked at an illuminated blank wall and pressed gently on the eye. Purkinje,[3] in 1819, pointed out that any circulatory disturbance caused by bodily movements or fever made the spots easier to observe, and that it was necessary to have the eye illuminated in order to perceive these. J. Müller [4] found that bodily exertion, sneezing, coughing or forced respiratory movements produced pulsations in the movements of the dots. Reute [5] mentioned the phenomenon in his textbook in 1854, and in the same year Meissner [6] found that he could see the movement of the particles by either pressing on the eye or looking at a bright lamp shade through a pinhole opening. H. Müller [7] was able to visualize his own retinal blood vessels by moving a stenopeic slit in front of the eye, and when the slit was held still, he noted that the course of these moving particles coincided with these vessels. Vierordt [8] was the first to give a thorough description and to attempt a measurement of the speed of the retinal circulation by making use of the phenomenon. Leiblin [9] later confirmed his results. Helmholtz [10] at first was skeptical about the particles being blood cells. He argued that they were far too few in number, their paths too far from one another, and their movements too swift to be caused by blood corpuscles. After repeated observations, however, he regarded them as "an optical representation of little obstructions in the circulation of the blood, occurring ordinarily only at certain constricted places of the vascular tract, and only when a rather large corpuscle tries to get past."

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Rood [11] was the first to find that the particles could not be seen equally well through different colored glasses. He showed that they were best seen when looked at through cobalt glass and that they became invisible when red, yellow or green glass was used. A year later, Reuben [12] confirmed this observation. Aubert [13] gave a fairly full account in his book on the physiology of the retina in 1865. In 1868, Hippel and Grünhagen [14] found that the size of the pupil was without influence, and that instillations of atropine or physostigmine did not cause any change.

Becker,[15] Ayres,[16] Zehender [17] and Norton [18] have all written on the subject without giving additional information as to what the particles are. The latter, however, disagreed with all previous investigators, and regarded the spots as the result of cell explosions. His idea, although novel, has little to give it support.

The first real step forward in elucidating the phenomenon was the work of Abelsdorff and Nagel [19] in 1904. These authors used various parts of the spectrum in order to make the moving particles visible and found that this occurred in the region from 350 to 450 millimicrons. They called attention to the fact that this was the region of the spectrum which is absorbed by hemoglobin, and on the strength of this they made the following hypothesis: the moving particles are the red blood cells passing through the retinal capillaries. In their passage the hemoglobin absorbs the blue end of the spectrum, and hence a slight shadow is cast on the underlying rods and cones. This shadow will naturally be more dense in light which hemoglobin absorbs; hence, the phenomenon is best perceived in light of such wave lengths. These authors also called attention to the fact that the movement of the corpuscles is not present in the fovea, and this is what one would expect were the particles really blood corpuscles, since the fovea is a blood-free area. They mapped out this blood-free area in Nagel's eye and found it to be about 1.5 degrees in diameter. They regarded it as probable that the shadows of the blood corpuscles arose only when the corpuscles passed down into the outer layers of the retina, and vanished again as they ascended into the inner layers. This would explain why the single points follow each other at such relatively long intervals.

Fortin [20] demonstrated the corpuscles best to his satisfaction by using a mercury vapor lamp shielded by blue glass. He believed, however, that the particles were not erythrocytes but white blood cells. Harvey [21] also agreed that what one sees are leukocytes. He stated that the bright points in any small field selected for observation are not sufficiently numerous to be red corpuscles. He stated the belief that "the red corpuscles overlap one another and cast a continuous shadow on the retina but that when a white cell comes along which does not absorb the blue light, having no hemoglobin, we have a rift in the shadow figure which corresponds to the movement of a shadow across

the rods and cones analogous to the movement of the pinhole in the demonstration of the large retinal blood vessels, i.e., Purkinje's phenomenon." Thus, he believed that one sees the white corpuscles by contrast with the red corpuscles, and therefore sees them best in light which casts the best shadow. Since red light passes almost equally well through both erythrocytes and leukocytes, a contrast does not appear.

Bühler [22] put forward still another possible explanation. He considered that each particle is seen as a light point due to the refraction of the light by the concavoconvex surfaces of the red blood cells.

It is extremely perplexing to make all of the observed facts fit into any one of these theories. There can be scarcely any doubt that the phenomenon is connected intimately with the circulation of the blood. The particles move in more or less definite paths, having the arrangement of capillary loops; the movement is often pulsatile and shows marked acceleration after anything which speeds up the heart. Finally, the area around the fovea which is known to contain no blood vessels fails to show any movement of corpuscles (vide infra). It is a different matter, however, to convince oneself that the particles are either red or white cells. Their number and relatively wide spacing would at first incline one to Harvey's opinion, and, further, the corpuscles appear light against a darker background which is not consistent with the thought that what one sees are shadows of red blood cells. But Harvey's explanation requires a film of closely packed red cells evenly distributed over the retina at all points, except where a white cell occurs. It is impossible to conceive of this. It is known that the spaces between capillaries are relatively wide—much wider than the diameter of a leukocyte, in fact. Where such spaces as these occur, therefore, were Harvey correct, one should see large, stationary, bright spots against the darker outlines of the capillaries. Further, the foveal area free from capillaries should appear light for the same reason.

In 1924, Scheerer [23] offered an explanation of the phenomenon which may perhaps more nearly fit the observed facts. He assumed that the light rays of short wave length are so bent in the red corpuscles that they suffer total reflection. The corpuscles, therefore, become self-luminous, while the arrangement of the accompanying shadowy outline of each corpuscle is to be explained by the different thickness of the corpuscle between the middle and the edge and the cylindric effect of the vessel tube. About the same time Fischer [24] considered that the particles were erythrocytes and answered the objection raised by Helmholtz by stating that the blood corpuscles are just big enough to be perceived when they occur in the retina. Their mean diameter is 0.0072 mm., and the size of the smallest recognizable spot is about 0.0051 mm. Since these cells lie just in front of the percipient retinal layers, the conditions under which they are perceived as an entoptic

phenomenon are far different from nonentoptic objects. The rapidity, relative scarcity and the wide separation of their paths can all be explained by the small distance which separates them from the layer of rods and cones and by the anatomic arrangement of the retinal blood vessels. The circumfoveal capillaries when viewed entoptically through a narrow slit also show similar wide intercapillary spaces. Fischer believed that the brightness of the particles seen on a darker background is due to the shadows of the cells giving a negative after-image. In a further article Scheerer [25] criticized the idea that the corpuscles are shadows of the red blood cells. He stated that the thickness of a single erythrocyte is about 0.0016 mm. In such a thin layer even the most opaque metals would be transparent; for instance, gold leaf is transparent when the thickness is 0.008 mm. Therefore, a cell the thickness of an erythrocyte could hardly be expected to cast a shadow. It occurred to me [26] that a definite answer to the question whether the corpuscles were red or white cells might be obtained by a comparison of the phenomenon in the normal subject and in patients with leukemia. In this disease the leukocytes are present in enormous quantities in all the blood vessels, whereas there is a considerable diminution in the red count. Hence if it were possible to establish a normal count of the corpuscles seen entoptically and compare this with a similar count from a series of patients with leukemia, an answer should be easily given. If the cells are erythrocytes, the leukemic patient should see fewer per unit area; if they are leukocytes, he should see many more than normally. Unfortunately, no means has been found so far by which one can establish a normal count. The corpuscles are so elusive that all attempts to make counts in any given area of the field have failed.

Gescher [27] has recently advanced a new theory concerning the necessity of using blue light in order to see the corpuscles. He showed that the blood corpuscles become visible only when they are looked at through a glass which permits a mixture of blue and red to come through in such a manner as to bring out the chromatic aberration of the eye to its fullest extent.

Granted that these particles are in the blood stream, to what exact situation of the retinal circulation have they been assigned? There are two main opinions on the subject: either the corpuscles are in the precapillary arterioles, or they are in the capillary loops in the inner retinal layers. Scheerer stated the belief that the phenomenon occurs in the finer branchings of the arterioles; Gescher [28] concluded that they are in the finest branchings of the retinal vessels which can be seen entoptically, and has given as evidence drawings which he made of the appearance of his own retinal blood vessels seen entoptically (method of Purkinje) and of the pattern made by the corpuscles as they traverse his circumfoveal area. By superimposing these pictures the correspondence is so

striking, according to this author, that there can be little doubt that the corpuscles are in these particular vessels. Gescher does not state, however, whether or not he believes the vessels he sees entoptically are capillaries. Nearly every one who observes the phenomenon hesitates at first to call the dancing particles blood cells because of the short curved course they seem to take. It is not the picture of blood cells coursing through capillaries as seen in a mesentery under the microscope. The corpuscles seem to swing suddenly into view, and almost immediately disappear. Because of this, Fick [29] decided that the corpuscles could not be blood cells.

Working on injected specimens of the retina of rats and man, Hesse [30] found the distribution of the capillary loops in two main divisions—an arterial capillary network in the innermost layers of the retina, the result of the breaking up of the central artery into fine twigs. From this capillary network, which is spread out laterally in the layer of nerve fibers, loops descend vertically into the deeper layers, in which they join with a second network predominately venous. The collection of blood from this capillary bed, which goes no deeper than the inner nuclear layer, forms the main branches of the central retinal vein. This arrangement makes W. His [31] consider Fick's criticism unjustifiable. He pointed out that the paths taken by these corpuscles correspond to the character of the capillaries in the inner nuclear layer. He asserted that one can explain why the corpuscles always appear singly by the fact that these capillaries are so narrow that they do not permit a continuous stream of cells to pass through. He does not believe, however, that one sees these cells as a distinct retinal image but only the shadows which they cast.

Whatever the exact situation in which these corpuscles are seen entoptically may be, the phenomenon has been made use of in a number of different ways by those who have observed it. It has already been stated that Vierordt [8] tried to measure the speed of the retinal circulation by this means. He considered that the corpuscles were in the larger vessels because of their apparent speed and found an average rate of 0.51 mm. per second. It is difficult to see how such measurements were obtained in view of the short course which each of the corpuscles seem to take.

The phenomenon has served a useful purpose in measuring accurately the blood-free area around the fovea in the living subject. Abelsdorf and Nagel [19] as has been stated, found the area about 0.41 mm. in diameter in Nagel's eye. Gescher [28] gave a value of 1° 29′ or 0.482 mm. in his own eye. Sperling, Miller and I [26] measured the diameter of the blood-free area in seventy-eight normal eyes by means of a diaphragm placed between the eye and a groundglass plate on which was thrown the light of an arc lamp. The eye observing the phenomenon looked through a uviol filter and fixed on the center of two

cross hairs fastened on the diaphragm. A pointer was attached to the handle of the diaphragm, and the width of the aperture was measured on a calibrated scale. A + 4 diopter sphere was placed in front of the diaphragm within its focal length and gave thereby a virtual magnified image of the diaphragm opening to the subject. With the subject fixing on the center of the cross hairs, the diaphragm was gradually closed until the dancing corpuscles were no longer seen. Similar measurements were made with the diaphragm closed and gradually opened until the corpuscles first became visible. By means of a simple calculation the diameter of the blood-free area of the fovea could thereby be measured. In the great majority of cases this was found to be between 0.4 and 0.5 mm. There was no correlation between the size of the area and the visual acuity or the refraction after correcting glasses were worn. Although nearly all the eyes showed an average of about 0.4 mm., the total range was from less than 0.2 mm. to as high as 1 mm. The two eyes of the same subject were in every case nearly identical. In all but eight of thirty-eight cases the difference between the two eyes was less than 0.0075 mm. Although wide variations seemed to exist between subjects, the fact that the two eyes of the same person were usually identical suggested that this method might be applicable for clinical use.

Fischer [24] made use of the phenomenon to study the effects of drugs on the fovea. In 1920, Hess [32] found that instillations of physostigmine and pilocarpine changed the entoptic appearance of the Maxwell spot in the fovea and that many of the circumfoveal capillaries disappeared under the influence of these drugs. Since the blood vessels which Hess observed were arterioles, Fischer believed that he could get more intimate information of what was taking place in the capillaries by making use of the entoptic movements of the corpuscles in the capillary circulation. By pressing on the eye, the movements of the corpuscles become slower and finally stop. When the pressure is removed, the movement becomes quicker than before. Fischer used Baillart's ophthalmodynamometer held in a device such that pressure could be exerted against the globe and measured accurately. The streaming of the blood corpuscles ceases as soon as the intra-ocular pressure is higher than the pressure in the capillaries. The actual intra-ocular pressure at which this occurred was determined by means of the ordinary Schiotz tonometer. Fischer found the normal capillary pressure by this means to be about 50 mm. of mercury. When physostigmine was instilled into the eye, the capillary pressure fell to some extent, but this was much more noticeable when pilocarpine was used. Other drugs were also used with less evident effects.

Scheerer [25] has laid great stress on the appearance or nonappearance of pulsation in the movements of the corpuscles and has examined more than 500 eyes to determine the incidence of pulsation in the normal

subject. He believes that normally the movement of the blood is pulsatile. In all diseases which do not affect the retinal vessels, especially in diseases of the anterior segment of the globe, no change in pulsation is observed, nor has he found that in recent diseases of the posterior segment, especially of the retina itself, there is any change in the type of movement. In cases which were labeled the vasoneurotic type by clinicians, Scheerer found that the movements were not pulsatile but uniform; hence, he believes that this uniform type of movement is a symptom of a vasoneurosis, depending on the relaxation of the retinal arterioles. In chronic diseases of the posterior segment, especially when the retina is involved, he found the movement nonpulsatile. In all cases in which arteriosclerotic changes were seen in the retinal vessels, the movement was uniformly nonpulsatile. In a few cases of obstruction of the central artery the movement was also nonpulsatile, and this was true not only of the diseased eye but of the opposite eye which was apparently normal. It appears, therefore, that the nonpulsatile type signifies a certain general disposition to such diseases. All cases of primary glaucoma gave nonpulsatile movements which he believes is further evidence to that already adduced in favor of an unstable condition of the ocular capillaries in glaucoma. Scheerer hopes therefore to make this examination a practical aid in the diagnosis of diseases primarily affecting the retinal blood vessels.

A review of the foregoing literature on the subject allows one to draw certain conclusions:

1. It seems definitely established that one can visualize cells in one's own retinal circulation provided the proper light is used. The rays from the short-waved end of the spectrum are undoubtedly the best for this purpose; the raison d'être for this, however, is still undecided.

2. Whether these cells are erythrocytes or leukocytes is also open to question, but the balance of evidence is in favor of their being red cells.

3. Their course is probably in the capillary loops in the internal nuclear layer of the retina, but here again further evidence is needed to decide this point.

4. The phenomenon has been put to several uses, chief among which are: (*a*) measurement of the speed of the retinal circulation; (*b*) measurement of the size of the macular region free from capillaries; (*c*) measurement of the retinal capillary pressure, normal and abnormal, and (*d*) determination of the condition of the retinal circulation from the presence or absence of pulsation.

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Correspondence

BENEVENUTO GRASSI'S "DE OCULIS"

To the Editor.—At the moment I am engaged in translating for publication, with introductory notes, Benevenuto Grassi's "De Oculis," etc., Ferrera, A.D. 1472, a treatise which has not been translated into modern English. As all informed ophthalmologists and students of medical history know, this is the first printed book on the eye and its diseases, a rare Latin incunabulum of which only about seven copies have survived the ravages of time. It has never been translated into any language, and it is now proposed to make it available to those who would like to read it in English.

Of the existing examples of this work, three are in American Libraries — one in the collection of the College of Physicians, Philadelphia, one in the Surgeon General's Library at Washington, and one in the Pierpont Morgan Library, New York.

In the proposed publication, it is intended not only to give a translation of the original Latin text but to describe briefly the various codices and printed versions of Grassi's famous treatise.

Although I am not aware of the existence on this side of the Atlantic of more than three copies of the Ferrera incunabulum, there may be others, and I write to ask if any of the readers of the ARCHIVES know of additional examples. I shall be grateful for this information.

CASEY A. WOOD, M.D., Stanford University, Calif.

Notes and News

EDITED BY DR. GEORGE S. DERBY

SOCIETY NEWS

Oxford Ophthalmological Congress.—At a recent meeting of the council, the following officers were elected for 1929: Bernard Gridland, master; Philip H. Adams, deputy master; Robert J. Coulter, honorary treasurer; C. G. Russ Wood, honorary secretary, to whom all communications should be addressed, at 12 St. John's Hill, Shrewsbury. The dates of the next meeting are July 4, 5 and 6, 1929.

Dallas County Medical Society.—Dr. William M. Lively addressed the society recently on treatment of pneumonia, and Dr. William H. Stokes on "Ophthalmic Studies of Vascular Lesions of the Retina."

Chicago Ophthalmological Society.—The society was addressed on November 19 by Dr. Sydney S. Schochet on "Eye Transplants in Experimental Endometriomas" by Dr. Edward C. Ellet, Memphis, Tenn., on "Glaucosan Therapy in Glaucoma," and by Dr. Peter Kronfeld on "Modern Viewpoints About the Mechanism of Glaucoma."

The staff on diseases of the eye of the Cook County Hospital held a "fundus clinic" under the auspices of the Chicago Ophthalmological Society on December 7.

The society held a symposium on optic neuritis on December 17, at 185 North Wabash Avenue, in which the speakers were Drs. William H. Wilder, Norval H. Pierce and Lewis J. Pollock. Dr. James E. Lebenson spoke on "An Oculogastric Reflex Experimentally Demonstrated."

Ophthalmological Society of the United Kingdom.—The Annual Congress of the Ophthalmological Society of the United Kingdom will be held in London on April 11, 12 and 13, 1929. The discussions are: "Heterophoria"; openers, Mr. E. Maddox, Capt. Cecil Clements and Mr. Charles Goulden; and "The Diagnosis and Treatment of Ocular Tuberculosis"; openers, Sir Arnold Lawson, Dr. R. A. Young and Mr. S. A. Browning.

Minnesota Academy of Ophthalmology and Oto-Laryngology.—The Minnesota Academy of Ophthalmology and Oto-Laryngology was addressed in December at Minneapolis by Dr. George F. Suker of Chicago, on "Lesions of the Visual Pathway," illustrated with specimens.

Indiana Academy of Ophthalmology and Otolaryngology.—Dr. Albert E. Bulson, Jr., of Fort Wayne, was elected president of the Indiana Academy of Ophthalmology and Otolaryngology at the twelfth annual meeting in Indianapolis on December 13.

UNIVERSITY NEWS

Professor Weill has been nominated professor of the Ophthalmological Clinic in Strassbourg.

Doctor Teulières is now in charge of the chair of ophthalmology at Bordeaux, in which he succeeds Prof. F. Lagrange, deceased.

Professor Duverger leaves Strassbourg to become professor of ophthalmology in the medical school at Limoges.

Clarence E. Ferree, Ph.D., and his wife, Gertrude Rand, Ph.D., from Bryn Mawr College, have taken up their new work in the research department of the laboratory of physiologic optics of the Wilmer Institute. Dr. Rand will be associate professor of research ophthalmology.

PERSONAL

Dr. Walter B. Lancaster is sick at the Massachusetts General Hospital in Boston. His many friends wish him a speedy recovery.

DEATHS

Dr. Homer Erastus Smith of New York, aged 72, died on October 5, at Norwich, Conn., of pulmonary thrombosis. He graduated from the Medical Department of Columbia College, in the class of 1878. He was a member of the Medical Society of the State of New York, and had formerly been on the staffs of the Manhattan Eye, Ear and Throat Hospital and the Herman Knapp Memorial Hospital.

Dr. Lucien Howe, aged 80, died of pneumonia at his home in Belmont, Mass., on December 27.

Abstracts from Current Literature

EDITED BY DR. WILLIAM ZENTMAYER

Anatomy and Embryology

THE CANAL OF CLOQUET OR HYALOID CANAL OF THE VITREOUS BODY. C. DEJEAN, Arch. d'Anat. d'Hist. et d'Embryol. **6**:65, 1926.

The author discusses the development of the hyaloid canal in the higher vertebrates and its function in the adult. He examined the eyes of the sheep, ox, rat, rabbit, cat, pig, horse, and man. An injection of a dye is made into the hyaloid canal by way of the optic nerve. The whole eyeball is then fixed in formaldehyde. The canal is present in all the forms studied. It is usually found next to the visual axis but occupies a different position in the adult than in the embryo. The contents of the canal seem more liquid than the rest of the vitreous and it is possible that the canal is a mechanism for regulating changes of pressure in the vitreous chamber by the elimination of excess liquid.

F. H. ADLER.

Physiology

THE OSMOTIC PRESSURE OF THE AQUEOUS HUMOR AND ITS PHYSIOLOGIC SIGNIFICANCE. W. STEWART DUKE-ELDER, J. Physiol. **62**:315, 1927.

Using a micro-osmometer, in which small samples of blood and aqueous humor taken from the same rabbit and kept under strict asepsis were allowed to come into ionic equilibrium through a cellophane membrane, the author successfully measured the colloid osmotic pressure. The changes in the total concentration of dissociated salts were determined by measurements of electrical conductivity. Changes in the concentration of nondissociated crystalloids were determined by analyzing the changes in the concentration of sugar.

It appears that the molecular concentration of the aqueous is equal to that of a dialysate of capillary blood. This would account for the practical identity of the concentration of nondissociated diffusible substance (sugar) in the two fluids and the preponderance of cations (chlorine) in the aqueous. The osmotic pressure of the aqueous is, therefore, less than that of the blood. The difference between them is determined partly by the difference in distribution of their ions, and partly by the difference in the concentration of their colloid constituents.

This suggests that the aqueous humor is a dialysate of capillary blood. When it is equilibrated with arterial blood its refraction, conductivity and sugar content remain practically unaltered. Any change which occurs is in the direction of equilibrium with venous blood.

THE PHYSIOLOGIC OPTICS CONCERNED WITH THE ENTOPTOSCOPIC VISIBILITY OF BLOOD CORPUSCLES IN THE EYE. JULIUS GESCHER, Arch. f. Augenh. **98**:375, 1927.

The author has investigated the necessity for using blue light in order to bring out clearly the entoptic perception of the blood corpuscles in the eye. In a previous paper (*Arch. f. Augenh.*, 1925, vol. 96) he showed that the course which these little particles seem to follow coincides with the outlines of the finer branchings of the retinal vessels also seen entoptically, and by injection into the vessels around the fovea. He points out the peculiarities of chromatic aberration in any optical system and shows that the blood corpuscles are visible only through

a glass that admits a mixture of blue and red light in such a manner as to bring out the greatest chromatic aberration of the eye. This is done by observing the filament of an electric lamp through a cobalt glass and a red filter.

A blue and a red image of the filament are obtained, the distance between which can be measured when projected against a scale. By this method the chromatic aberration is found to be greatest in that portion of the spectrum which is commonly used to obtain the entoptic phenomena of the corpuscles of the blood. Chromatic aberration is given as an explanation of some of the facts connected with this phenomenon; for example, the shadows which the corpuscles seem to cast. Photographs of blood films in an ordinary blood counting chamber strengthen the simile.

By means of especially made glasses which increase or decrease the chromatic aberration of the eye, the phenomenon can be intensified or diminished.

F. H. ADLER.

REGARDING THE DEPENDENCE OF THE INTRA-OCULAR PRESSURE ON THE H-ION CONCENTRATION OF THE BLOOD. W. WEGNER and G. ENDRES, Ztschr. f. Augenh. **64**:41 (Jan.) 1928.

An experiment is reported which sought to determine the influence of p_H on the height of the intra-ocular pressure. According to Maesmann, increased alkalinity of the blood is always present in glaucoma simplex. The height of the pressure and the degree of the blood change are apparently parallel. Normal tension similarly is dependent on the normal reaction of the intra-ocular fluid, which is somewhat alkaline like the blood. Increase in tension is accompanied by increasing alkalinity of the intra-ocular fluid, proportionate to the increase in the alkalinity of the blood. To determine the effect of a diminished H-ion concentration of the blood, three persons were examined after intensive overventilation of the lungs. This procedure causes a dislocation of the blood p_H in the direction of alkalinity which is considerably greater than that obtained by diet. The experiment was conducted to the point of beginning symptoms of tetany. In none of the three cases was there any alteration of the intra-ocular pressure, nor could any change of the p_H of the intra-ocular fluid be recognized with direct electrometric investigations. The observations were repeated for half or three quarters of an hour after the close of the experiment and were found constant. The authors recognized that the conditions were not parallel to such chronic disorders as glaucoma simplex and the acidosis of diabetes, but simply showed that an excessive increase in the alkalinity of the blood was not accompanied by a corresponding increase of the intra-ocular pressure.

S. J. BEACH.

DISCRIMINATION IN ANOMALOUS TRICHROMATES. CARL ROSENCRANTZ, Ztschr. f. Psychol. u. Physiol. d. Sinnesorg. **58**:5, 1927.

Using Nagel's color-mixing apparatus, the author investigated a normal person, persons with red-green blindness, one of mild and the other of severe degree, and came to the following conclusions:

1. In the mild case, there was a moderate depression of the ability to discriminate colors equally distributed through the whole spectrum.

2. In the severe case on the other hand, this depression showed in certain regions only, for instance, in yellow and yellow-green, whereas in the blue-green region the discrimination was normal.

By tests with a modified apparatus he concluded that:

3. In the short wave end of the spectrum, up to 540 millimicrons, the discriminative ability in the extreme case coincides with that of a protanope; only in the long waved regions in which the protanope does not recognize any color, does a difference occur.

4. Like the protanope, the extreme red-anomalous case possesses a sharply demarcated neutral point at the site of the sharpest discrimination.

5. It appears that the shifting of intensity of brightness in the spectrum toward the blue increases with the degree of the protonomaly. Further investigations are under way to determine this point.

F. H. ADLER.

Congenital Anomalies

CONGENITAL BILATERAL MICROPHTHALMOS ACCOMPANIED BY OTHER MALFORMATIONS OF THE BODY. A. M. YUDKIN, Am. J. Ophth. **11**:128 (Feb.) 1928.

The other malformations present were: a malformed heart on the right side, an undescended left testicle, bilateral talipes calcaneovalgus, supernumerary and deformed fingers, a congenital defect in the diaphragm with herniation of the stomach and spleen into the thoracic cavity, and a double ureter. The child died when 35 days old. The author gave the following summary and conclusions: The case seems to be that of a simple microphthalmos. It was probably produced by the presence of mesoblastic tissue and persistent embryonic vasculature in the vitreous cavity. The nourishment furnished from this source was beneficial only to the retina, which grew prolifically.

This sustains the contention of von Hippel that the expansion of the globe depends on the normal inhibition of fluid by the vitreous. The microscopic picture of the eye indicates that the course of further growth of the vitreous was probably altered by the underdevelopment of the ciliary body and its processes, hyperplasia of retinal tissue and lack of choroidal vascularization. It was probably this arrest of development which was responsible for the microphthalmos. It was surmised from the presence of the Wintersteiner retinal rosets that they were not pathognomonic of a malignant condition, as often contended.

PSEUDOGLAUCOMA. A. FUCHS, Brit. J. Ophth. **12**:65 (Feb.) 1928.

The author refers to a previous paper in the *American Journal of Ophthalmology* in which some anomalies which might be mistaken for a glaucomatous excavation were pointed out, such as: an oblique insertion of the optic nerve; a large physiologic cupping; branching of the central vessels behind the lamina cribrosa, so that their individual branches emerge only at the margin of the papilla and a congenital coloboma of the papilla if a circumscribed depression of its surface has produced a pitlike cupping.

The author records the occurrence of a congenital pit coexisting with a glaucomatous excavation. The pit admits of a twofold interpretation. It may be a deeper part of the general glaucomatous excavation, a less resistant part of the lamina cribrosa which yields to the intra-ocular tension more than the rest. This would be found only in glaucoma of long standing with extreme hypertonia. On the other hand, there may be a simple coincidence of glaucoma and congenital pitting.

He also reports a case of colobomatous excavation simulating glaucoma. Reduced vision and the aspect of the papilla indicated glaucoma but the fact that

the papilla was larger on the left proved the case to be a congenital colobomatous excavation. There was a greatly enlarged blind spot extending along the horizontal meridian. One year later the picture was unchanged. A similar case in a girl, aged 12½ years, is described.

As a condition resembling inflammatory glaucoma, a case of angiectasia of the eyeball is cited. A boy, aged 14 years, complained of unsteady and failing vision. The conjunctiva of the lids and transitional folds exhibited small vessels between the larger ones, with occasional minute varicosities. There were also delicate trachoma cicatrices. On the globe were numerous vessels of unusual breadth and tortuousity running backward from the limbus. The dark color showed them to be veins. To a lesser degree, an analagous change existed also in the vascular system of the retina, a macular vessel being enlarged and tortuous within the papilla. All the symptoms of glaucoma were absent.

The author cites two other cases from the literature and one case communicated to him by his father. The condition appears not to be congenital.

W. ZENTMAYER.

Color Sense

THE FREQUENCY OF CONGENITAL ANOMALIES OF COLOR SENSE IN BOYS AND GIRLS. P. VON PLANTA, Arch. f. Ophth. **120**:253 (April) 1928.

School children were examined with the common color tests and with the anomaloskop. Of 2,000 boys, 7.95 per cent were found with a defective color sense; of 3,000 girls, only 0.43 per cent. The color test, which was devised by Ishihara in 1917, detected all the cases of a defective sense of color, and is more reliable then any of the other color tests. As to reliability and certainty the tests can be put in the following order: Schaaff's tableaux mosaiques, Stilling's pseudoisochromatic plates, Cohn's plate and Nagel's plates. Nagel's plates were found to be complicated, fatiguing and unreliable; about 15 per cent of the patients with a defective color sense stood the test.

P. KRONFELD.

Methods of Examination

TESTING THE CORNEAL SENSIBILITY WITH PRESSURE THROUGH THE LIDS AS A DIAGNOSTIC EXPEDIENT. W. COMBERG, Ztschr. f. Augenh. **64**:127 (Feb.) 1928.

Comberg states that the ordinary test for corneal sensibility, which uses a wisp of cotton through the open lids, merely shows whether the sensation is present or diminished, and does not determine whether it is exaggerated. By palpation through the closed lids, points of increased sensitiveness are noted, not so much in the ciliary region, as described by Falta, but over corneal lesions such as scratches, erosions and sites of foreign bodies. If increased sensitiveness to palpation with the finger tip is found, a definite location is sought by means of a glass rod. Most disorders producing increased corneal sensitiveness are obvious because of photophobia and lacrimation. This method, however, is extremely useful in judging the progress of healing in sluggish ulcers and erosions. The author also points out the help which it gives in distinguishing malingerers who give inconsistent answers, particularly on examination with the glass rod, or who lay claim to a general sensitiveness which is not in accord with other indications.

S. J. BEACH.

Physiologic Optics

THE DEMONSTRATION OF THE CORNEAL SURFACE AND ITS CHANGES BY MEANS OF THE REFLECTED IMAGES. F. P. FISCHER, Arch. f. Augenh. **98**:1, 1928.

The author photographs the reflections from the anterior surface of the cornea. From the changes in the reflections obtained under varying conditions he seeks information about the physical properties of the reflecting surface. The work is similar to that done by Rosch on the photography of crystals. Parallel rays of light are thrown in a narrow bundle on the cornea and each reflection falls on a photographic plate. The source of light is an arc lamp with suitable filters attached. Exposures are made on x-ray films by means of a pendulum which opens and closes the shutter. An exact description of the instrument is given together with the underlying physical principles employed.

There are only two actual reflecting surfaces: the surface of the layer of tears and the anterior surface of the cornea. The tears are of importance in modifying the reflexes because of: (1) their refractive index; (2) their admixture of corpuscular elements, and (3) their chemical composition.

The results of the studies are presented in two main sections:

In the first, the author considers the reflections from the normal cornea of rabbits and then the changes encountered after the application of various mechanical forces. There are a number of characteristic reflex formations from the normal cornea which are altered characteristically depending on the extent of the physical violence employed. Wherever the epithelium is damaged, the reflexes will naturally be greatly altered. Even though the changes seen with the usual magnification and fluorescein staining may be quite insignificant, they appear most pronounced when viewed by this method. The slightest bedewing of the epithelium produces decided changes in the reflex picture. Alterations of the posterior surface of the cornea, however, do not affect the reflexes. The effect of drugs and certain chemicals is next considered. Although each drug seems to duplicate, more or less, certain characteristic changes in the picture, the physical changes in the cornea which underlie these changes are not known. Substances which have a close chemical relationship do not produce similar changes in the images.

In the second section, the work is extended to the clinical examination of human eyes, normal and diseased, which show more or less characteristic changes produced by the various states of the diseased corneal epithelium.

F. H. ADLER.

Experimental Pathology

NAPHTHALIN CATARACT. E. PANICO, Ann. di ottal. e clin. ocul. **56**:799, 1928.

The literature on the experimental production of cataract by naphthalin and the few cases of the condition observed in man is reviewed. The author used thirty rabbits for feeding experiments. He gave 1 Gm. naphthalin in olive oil per kilogram daily. The first changes seen were swelling and necrosis of the epithelium of the capsule of the anterior lens. Irregular epithelium was developed on the capsule of the posterior lens. Water fissures were seen in the cortex and the fibers of the lens assumed a granular appearance in section. Vacuoles appeared around the nucleus. Iridescent needles could be seen early with the slit lamp before the water fissures appeared. The lenses increased in volume and anteroposterior diameter. Lenses removed in the capsule and placed in the serum of naphthalinized animals increased in volume and weight as compared with lenses placed in normal serum. Changes in the retina or uveal tract were not seen which would account for the changes in the lens. A toxic substance is formed, apparently, by the breaking down of naphthalin in the body, causing the changes in the lens.

S. R. GIFFORD.

MODIFICATION OF THE FOLLICLES OF CILIA AFTER ELECTROLYSIS. A. ANTONIBON, Ann. di ottal. e clin. ocul. **56**:911 (April) 1928.

Cilia of dogs were submitted to electrolysis with from 4 to 5 ma. for from five to ten seconds. Sections were then made of the lid border to study changes in the folicles at various periods after the treatment. A small amount of human tissue, removed at operation, was also available for study.

The immediate result of electrolysis was a coagulation necrosis of the epithelium of the follicle, extending sometimes to nearby glands. This was followed by an inflammation with serous exudation and leukocytic infiltration, lasting about five days. This gave place to a proliferation of connective tissue and a cicatrization of the destroyed region which was complete in from twenty to thirty days. Reformation of the follicle of the lash was never observed. If the needle did not penetrate the follicle, the destruction was often incomplete, portions of the follicular epithelium or even of the lash-bulb remaining.

S. R. GIFFORD.

Lids

SYRINGOCYSTOMA OF THE EYELID. S. S. GREENBAUM, Am. J. Ophth. **11**:275 (April) 1928.

The author states that this condition seems to have escaped the attention of American writers.

It is most commonly situated on the lower eyelid but may also occur on the upper lid. The lesions which occur in groups of two, three, or more, are soft and discreet, and the size of a pinhead or slightly larger. They are lighter than the skin or yellowish, standing out clearly from the surrounding normal skin, in flat but slightly elevated patches. Puncture yields only blood. Subjective symptoms are not found.

Histologically, most of the changes were found in the superficial part of the dermis. These consisted of epithelial tracts of polygonal or elongated cells looking like several gland ducts without a lumen. At some points oval or irregular cystic formations were found, in the cavities of which frequent granular or homogeneous hyaline material occurred. A definite relationship seemed to exist between the hair follicles and some of the collections of cells. The morphologic appearance was that of tricoepithelioma. This disease is to be distinguished from milia, xanthelasma and several other lesions of the skin.

The treatment consists in destroying each lesion with a fine cautery point.

W. ZENTMAYER.

Lacrimal Apparatus

PATHOLOGY OF THE LACRIMAL GLANDS IN CHRONIC EPIPHORA. M. N. BEIGELMAN, Am. J. Opth. **11**:125 (Feb.) 1928.

The possibility that a chronic dacryadenitis might exist without other clinical symptoms than epiphora was shown by the microscopic study of six lacrimal glands removed after the extirpation of the lacrimal sac. In four of these, different degrees of chronic inflammation were found. The distribution of the infiltration, near the excretory ducts and in the connective tissue surrounding the glands, suggested an extension of the inflammation by direct continuity from the subconjunctival tissue. The author suggested that roentgen irradiation, deep incision, cautery puncture or extirpation of the gland might prove to be the only satisfactory remedies in selected cases of chronic epiphora.

W. ZENTMAYER.

Conjunctiva

SERIOUS HEMORRHAGE FROM THE CONJUNCTIVA IN AN INFANT FOLLOWING THE INSTILLATION OF SILVER NITRATE SOLUTION. J. G. F. HEAL, Brit. J. Ophth. **12**:33 (Jan.) 1928.

A 15 per cent solution of nitrate of silver had been instilled into the eyes of a new-born infant five times in thirty-four hours, as ordered by the medical attendant. The bleeding which was mostly from the left eye could not be checked by the usual means. The child who was growing weak was anesthetized for examination. The conjunctiva of the upper lid showed an extensive raw area. The bleeding points, which were chiefly in the region of the subtarsal furrow, were sealed with a heated probe.

TWO CASES OF PARINAUD'S CONJUNCTIVITIS. C. D. VERRYP and T. A. HALBERTSMA, Brit. J. Ophth. **12**:79 (Jan.) 1928.

The first case was seen in a boy, aged 16 years, and the second in an unmarried woman aged 23.

Both cases showed a relatively acute onset, involvement of the homolateral glands, synechia with the changes in the eye, elevation of temperature, and enlargement of the spleen and conjunctiva. In the first patient, the hemoglobin index and the erythrocyte and leukocyte counts were normal. The number of eosinophil cells did not increase. There was a decrease of polymorphonuclear leukocytes with numerous lymphocytes. In the second patient, the hemoglobin index was 66 and the leukocytes, 9,400. Leukocytes comprised 78 per cent of the total number of cells; polymorphonuclears, 8 per cent and mononuclears 14 per cent.

The gland swelling persisted considerably longer than the changes in the eye. The histologic examination gave results daily which resembled those found by Morax and Verhoeff. A causative micro-organism was not found. Verhoeff's staining method did not reveal leptothrices. Inoculations in the guinea-pig were negative at the end of five months. It was considered highly improbable that tuberculosis was responsible for the disease.

W. ZENTMAYER.

A DISEASE OF THE CONJUNCTIVA, WITH EXUDATES, PSEUDOMEMBRANES, LESIONS OF THE CORNEA AND RECURRENT GRANULOMAS. MORAX, Ann. d'occul. **165**:401 (June) 1928.

Morax described two of his cases and one each of Pavia and Kalt, which were practically identical. The symptoms began with a false membrane of the lids and throat, and fever. The cornea soon became involved, causing perforations. One case was so grave that enucleation was thought necessary, while the other three ended in complete atrophy. The third symptom of importance was the formation of small tumors, about 1 by 0.5 cm. in size, which developed on the tarsal conjunctiva, upper and lower. A persistent secretion was associated with the tumor.

At first diphtheria was thought to be the cause. Antidiphtheritic serum of Roux was given hypodermically and locally into the conjunctival sac, but without results.

The false membrane would disappear for several weeks at a time and then recur, or it would persist almost indefinitely. The removal of the tarsal tumor would be followed in three days by a pseudomembrane, covering the base from which the tumor had been resected. In spite of careful asepsis, the use of the actual cautery and electric coagulation of the blood, the tumor would reappear.

Bacteriologic examination failed to reveal the etiology, although numerous smears, cultures and inoculations of animals were made. Microscopic examination of the tumors showed them to be neither papillomas nor neoplasms, but granulomas arising from subepithelial tissue. Further investigation is necessary to determine the exact nature and cause of this condition.

H. W. SCARLETT.

Trachoma

EXPERIMENTAL AND CLINICAL RESEARCH ON A NEW TREATMENT OF PATIENTS WITH TRACHOMA: PRELIMINARY REPORT. V. RUATA, Arch. d'opht. **45:** 417 (July) 1928.

Ruata calls attention to the severe character and obstinacy of trachoma in persons of the so-called adenoid type. He divides cases of trachoma into two classes: (1) superficial or early cases and (2) deep or advanced cases. Those of the first class can be overcome with the various forms of treatment already in use because it is unnecessary for the drugs to penetrate deeply. The fact that they do not penetrate the conjunctival tissues deeply makes them of little value in the second class of cases.

Ruata then points out that even in argyrosis the silver impregnation is limited to the superficial layers. The theory of iontophoresis is discussed. The deeper penetration of copper by this method is shown in sections of the conjunctiva of the rabbit. Attention is called to the many variable factors in this method, both in the manner in which the electric current is used and in the kind of drugs employed.

In general, this form of treatment is well tolerated and free from pain. It may be used every other day, or every day. The duration of a treatment may be from ten to thirty minutes, with the current never exceeding 25 ma., and usually averaging 10 ma. It is contraindicated in corneal lesions, and can be used only a limited number of times.

The results of the treatment of forty-eight patients with trachoma and extensive pannus are reported. Of these, 50 per cent were cured with cicatrization of the pannus; 28 per cent were improved but did not complete the treatment, and 20 per cent were unimproved.

It is predicted that this method will assume an important part in the treatment of patients with trachoma.

S. B. MARLOW.

Cornea and Sclera

KERATITIS FILAMENTOSA AND CHRONIC ARTHRITIS. A. W. M. HOUWER, Klin. Monatsbl. f. Augenh. **80:**10 (Jan.) 1928.

The author contends that the eye symptoms are secondary and due to special causes which, at first are hidden. He states that the filaments form as a consequence of urea deposited in the surface of the cornea. Crystals were not found. Dysfunction of the tear gland bears no relation to the formation of filaments, although cases are known which present degenerative keratitis coupled with disturbance of the tear gland. Atophan helped to remove accompanying symptoms of inflammation but not the filaments. Zinc sulphate and acetate of lead seemed to be of therapeutic value. The author concludes that keratitis filamentosa is an idiopathic condition, bilateral and incurable. The lower segment of the cornea is involved most frequently, the upper segment less, and the central least. As many as 100 filaments have been counted. Occasionally, they are missing, and superficial punctate keratitis is present. Thick, stringy conjunctival secretion is typical. The

vision may be comparatively good. The patients, mostly women, are of mature or old age. More than half of the patients suffered from arthritis deformans with special symptoms.

TATTOOING OF THE CORNEA WITH SILVER NITRATE, GOLD CHLORIDE AND PLATINUM CHLORIDE, BY LOCAL CHEMICAL ACTION. G. KRAUTBAUER, Klin. Monatsbl. f. Augenh. **80**:66 (Jan.) 1928.

The results of animal experimentation are reported. The color is developed chemically in the cornea itself. Silver nitrate solutions combined with hydrazin hydrate produce a dark sienna hue without damaging the tissues. Deep black can be obtained by the reduction of gold chloride and silver nitrate with hydrazin hydrate. The action is prompt. Platinum particles produce a black deposit by the combination of hydrazin hydrate with a diluted solution of platinum chloride. Concentrated solutions did not seem to produce an adverse effect. This method was first used by P. Knapp with colloidal gold (*Klin. Monatsbl. f. Augenh.* **79**:433, 1927).

K. L. STOLL.

Lens

THE AFTER-RESULTS OF CATARACT EXTRACTION. R. C. DAVENPORT, Brit. J. Ophth. **12**:85 (Feb.) 1928.

This is a statistical paper on the methods adopted and the results secured in 2,368 operations for cataract, performed at Moorfields between 1919 and 1925, inclusive. Of these, 25 per cent were simple. Peripheral iridectomy, which is showing a much greater usage during the last two years, was employed in 290 cases of a total number of 642. Preliminary iridectomy now is used but little. The visual results when complete iridectomy was done were appreciably worse than after other types of extraction. The figures seem to strengthen the contention that the intact pupillary rim prevents the capsule from becoming entangled in the wound. There was little difference in the visual results between simple extraction and peripheral iridectomy, but there were fewer excisions and no perception of light as compared with either of the others. The percentage of loss of vitreous in all cases was 4.2. The number in the combined operations was relatively much greater. This might be due to the fact that this was the operation of choice on eyes which were not normal, or in which the patient was a difficult subject. The percentage of needling was 62.4. Five cases of chronic infection, leading to excision, followed.

W. ZENTMAYER.

ENDOCRINE CATARACT. J. NORDMANN, Ann. d'ocul. **165**:29 (Jan.) 1928.

In 1919, Vogt gave a biomicroscopic description of the cataract complicated by retinitis, uveitis, hyalitis and glaucoma. Later study of this condition with the slit lamp has not yielded any new facts.

Vogt stated that complicated cataracts were due to faulty nutrition of the lens. Nordmann classifies them as endocrine cataracts, including diabetic, tetanic, mongolian and glass blower's cataracts.

The endocrine cataract may contain vacuoles or may be punctated, flaky or crystalline. The opacity may be spread over the surface of the lens, or may be limited. In certain cases it may be dense in the polar region or along the equator. The cataract may be in front of the posterior capsule or may be situated between the different divisions of the nuclei. It may involve the cortex solely or the nucleus.

Clincally, this cataract may be divded into three forms: saucer-shaped and punctated; flaky or crystalline, and arched. The first type resembles the cup-shaped

senile cataract, the second the coronary type, and the third approaches the complicated cataract.

One characteristic sign is the development of most of the trouble on the surface of the lens. This type of cataract is not rare and occurs in young nervous persons with a faulty internal secretion.

H. W. SCARLETT.

RESEARCHES ON THE BLOOD CHEMISTRY OF CATARACTOUS PATIENTS: CREATINE AND CREATININE. A. GIDONNANTONI, Ann. di ottal. e clin. ocul. **56**:916 (April) 1928.

The author continues his previous work which showed decreased renal function, slightly increased total nitrogen in the blood, and slightly decreased urea in the urine of cataractous patients as compared with that of normal persons of the same age group. The article includes a bibliography.

He reports the creatine and creatinine in the blood of a similar series of patients. He designates these substances as waste products of muscular metabolism which should be eliminated by the kidneys and be kept at a fairly constant level.

In nine normal persons aged from 44 to 70, the average creatinine was 11.28 mg. and the average creatine was 63.25 mg. per liter; in ten cataractous patients, the averages were 13.74 and 70.83 mg. These results are what would be expected from the previous figures for renal function and total nitrogen, and indicate a retention of these substances in the blood of cataractous patients. This accords with the conclusion of some other observers, based on a decreased toxicity of the urine, a decreased alkaline reserve in the blood and an increase in the blood sugar, that renal permeability is impaired in the cataractous patient. In the opinion of the author, however, these facts do not warrant definite conclusions as to their relation to the etiology of cataract.

S. R. GIFFORD.

A HIGH DEGREE OF MYOPIA DUE TO MICROPHAKIA WITHOUT DISLOCATION OF THE LENS. F. SAEGER, Klin. Monatsbl. f. Augenh. **80**:177 (Feb.) 1928.

A globe-shaped lens, 8 mm. in diameter, was suspended on the elongated zonula, where it remained after complete dilatation of the pupil. Central myopia was 18 diopters and the peripheral, from 24 to 25 diopters. The patient was 7 years of age. Four similar cases are quoted.

K. L. STOLL.

Vitreous

VITREOUS HERNIA, CONTAINING HYPHEMA, IN THE ANTERIOR CHAMBER. H. H. ELSCHNIG, Klin. Monatsbl. f. Augenh. **80**:200 (Feb.) 1928.

This condition was seen occasionally after intracapsular extraction of the lens. The blood remained liquid in the hernial portion protruding into the anterior chamber. The author corroborated the observations of A. Knapp that blood enclosed in a vitreous hernia of this type will absorb slowly; in some cases, not before three months.

K. L. STOLL.

Uvea

UVEOPAROTID FEVER AS A MANIFESTATION OF MICULICZ'S SYNDROME. L. HAMBURGER and A. SCHAFFER, Am. J. Dis. Child. **36**:434 (Sept.) 1928.

The literature is reviewed, and a typical case reported, apparently the second in the American literature. The patient, a boy, aged 12 years, showed, as his first symptom, fever which was present for two months before the ocular inflammation commenced. Two weeks later, the second eye became involved, and bilateral

parotitis developed. A definite bilateral iridocyclitis was present for two months. Then treatments with radium were begun for the parotitis; the uveitis and parotitis subsided within a few weeks, leaving normal vision in each eye. An etiologic factor could not be found. The tuberculin and Wassermann tests gave negative results. The authors conclude that the cases described as Heerfordt's disease or uveoparotid fever represent a form of Miculicz's syndrome. Though tuberculosis undoubtedly plays a part in the causation of this syndrome, it can often be excluded, as in the present case. The distinction of these cases from mumps is clearcut.

S. R. GIFFORD.

CLINICAL AND EXPERIMENTAL STUDIES ON THE RÔLE OF THE SYMPATHETIC IN THE ETIOLOGY OF HETEROCHROMIA. J. BISTIS, Arch. d. opht. **45:** (Sept.) 1928.

The author first discusses the terminology, and states his preference in favor of the term heterochromia because it is already generally adopted. He then points out that the presence of various kinds of changes in these eyes — cataract, chronic cyclitis, narrow palpebral fissures and small pupils which react abnormally to the instillation of homatropine and cocaine — suggests that it is a pathologic condition, and not a "jeu de la nature" as Manz first stated. He then reviews the cases presented in the literature, and calls attention to the fact that many of them are definitely associated with the symptoms characteristic of paralysis of the sympathetic system. He thinks that paralysis of the sympathetic system can explain all the changes found in the eyes. He then reviews the experimental evidence showing the direct connection of sympathetic nerve fibers and pigment cells in lower animals, and mentions the histologic changes in the iris of the cases of heterochromia reported by E. Fuchs, Treacher Collins and Lagleyze. He then refers to some experiments of Calhoun which confirmed his own earlier reports, before he reports a new series. He concludes that heterochromia, congenital or acquired, is due to sympathetic paralysis; that the deposits on the corneal endothelium are due to a vasomotor disturbance and not to a cyclitis; that the cataract is the result of a disturbed intra-ocular balance secondary to vascular changes, and finally that the symptom of heterochromia should be added to Horner's syndrome.

S. B. MARLOW.

Glaucoma

SOME FEATURES OF GLAUCOMA COMPLICATING IRIDOCYCLITIS. F. T. TOOKE, Am. J. Ophth. **2:**97, 1928.

In a well illustrated article showing the microscopic pathologic changes in secondary glaucoma, Tooke gives his observations on five typical cases of glaucoma complicating iridocyclitis. He states that although glaucoma is subdivided, customarily, into primary and secondary, recent investigations, notably those of Duke-Elder, Fisher, and Waite, led him to conclude that glaucoma is a symptom, not a cause, of disease; it is a result and not the establishment of a perverted physiologic function leading to a defect in the excretion of the aqueous, a rise in intra-ocular tension, and ultimate loss of vision.

Studies in biochemistry and in metabolism clearly show that biochemical changes and metabolic alterations of this kind are the factors which are primary, and that the symptoms which constitute glaucoma are secondary. He surmises from the clinical conditions and the microscopic specimens in the cases reported that in this type of glaucoma there are variations in etiologic factors, clinical manifestations, pathologic observations, treatment and results.

W. ZENTMAYER.

THE PATHOLOGY AND THERAPY OF GLAUCOMA. HANS SCHMELZER, Arch. f. Ophth. **120**:14, 1928.

This article is a synopsis of the pathologic physiology, and of the treatment of glaucoma, as seen from the standpoint of Seidel's school. The basis of Seidel's formulation is Theodor Leber's doctrine, that a slow "stream" of fluid passes through the human eye, as the result of hydrostatic forces. The two most important changes which Leber's theory had to undergo were as follows: (1) The rôle of the colloidal osmotic pressure of the blood was recognized; (2) Seidel determined the pressure in the anterior ciliary arteries, and concluded that the ciliary pressure inside the eye was about 30 mm. of mercury. The colloidal osmotic pressure of the blood had to be deducted from this value, so that the hydrostatic forces which should cause the inflow of fluid in the eye, were thought to be between 0 and 10 mm. of mercury. With an intra-ocular pressure of 25 mm. of mercury on one side and a "hydrostatic pressure" of from 0 to 10 mm. of mercury in the capillary system, an inflow of fluid in the eye is impossible unless the presence of vital secretory forces is assumed.

The glaucomatous eye differs from the normal eye in several ways. First, "the normal eye represents a plethysmograph with porous walls, and the glaucomatous eye, or the eye with a glaucomatous disposition, can be compared to a plethysmograph with water-tight walls." This water-tightness can be tested in any glaucomatous eye by putting the tonometer with the 10 or 15 Gm. weight on the cornea for a while, and observing the decrease of tension. In glaucomatous eyes, this drop is found to be slight. Another test for relative water-tightness is the dark-light test, which gives valuable information in cases with habitus glaucomatosus. A certain amount of constant inflow of fluid in the eye is undoubtedly proved by the dark-light test. The only possible explanation of a positive dark-light test is constant inflow, and acute stoppage of outflow. The rise of tension is so typical for a certain period in the development of glaucoma, that one cannot attribute the rise in pressure to a change in the volume of blood inside the eye. In glaucomatous eyes, with deep or normal anterior chambers, the dark-light test shows little or no change of tension.

The angle of the anterior chamber is blocked in these eyes also, due to sclerosis of the cribriform ligament, for instance. The size of the pupil, however, does not influence the function of the filtrating angle. The mechanism of glaucoma must not be confused with the problem of the etiology and pathology of glaucoma. The former is well known, the latter still a problem. Often it is a local degenerative process of the tissues of the eye, caused by a lack of nutrition, possibly due to endocrinal, vasomotory, or vasoneurotic disturbances. These processes lead to the blocking of the anterior chamber, which is the essential point of Seidel's theory. Only an eye with a blocked anterior chamber shows marked changes of tension due to vasomotor processes.

The last chapter of Schmelzer's paper deals with the treatment of glaucoma: indications for surgical intervention in general and for each type of operation specifically. It is well known how and why iridectomy and trephining lower the tension in glaucomatous eyes. For the cyclodialysis, "the how" is still unknown. Schmelzer used the synthesis of indophenol as a measure of the cellular activity of the ciliary epithelium. Before and after cyclodialysis in normal rabbit eyes, he found the same amount of indophenol formed. He concluded, therefore, that the cyclodialysis does not lower the tension by causing partial atrophy of the ciliary body; it opens new communications between the anterior chamber and the vessels of the ciliary body.

Schmelzer describes the routine procedure for patients with glaucoma. It is approximately that used in the eye clinic in Heidelberg, and in most of the other

European clinics. The methods of treating glaucoma are rather uniform. Conceptions about the exchange of fluids in the normal eye are still extremely different.

GLAUCOMA. A. E. ELSCHNIG, Arch. f. Ophth. **120**:94, 1928.

The classification of glaucoma has become rather dubious during the last few decades. Elschnig, therefore, offers his old system in the following somewhat modified form:

1. *Hypertony of the eye*—continuously increased tension, without any sequelae, of the tissues of the eyeball and the optic nerve.

2. *Glaucoma compensatum*—excavation of the optic nerve, usually combined with increased tension. The rare cases, which do not show any pathologically increased tension at any time, might be called glaucomatous degeneration of the optic nerve.

3. *Glaucoma incompensatum (a) prodromale*—attacks of increased tension, followed by disturbances of the circulation and nutrition in all the tissues of the eyeball, well known as symptoms of "inflammatory glaucoma." The attacks subside by themselves, between them the eye looks normal and has normal function.

(b) Acutum—the severest form of decompensation. It does not subside by itself, and always does some damage.

(c) Chronicum—the eye is continuously decompensated and "inflamed." Miotics remove these symptoms for the time being used.

Groups 2 and 3 finally lead to the *glaucoma absolutum* or *glaucoma incompensatum degenerativum.*

The author gives a synopsis of the pathologic conditons of glaucoma, based chiefly on his own large amount of material. The glaucomatous changes of the corneal epithelium are explained in the same way as the herpes of the cornea: The increased tension causes a trophic disturbance of the corneal nerves which rapidly changes the colloidal conditon of the epithelial cells. Histologically, both changes, the taking up and the giving up of fluid, can be shown in the glaucomatous cornea. The fluid probably comes from the surrounding cells or from the stroma of the cornea, and is not aqueous, as stated by E. Fuchs.

Peripheral anterior synechia of the iris is nearly always present in uncompensated glaucoma, and is not of inflammatory origin. It is the most common reason for increased intra-ocular tension. There is a blocking of the canal of Schlemm and a snapping off of the root of the iris. Both outlets for fluid, therefore are obstructed and the circulation in the iris is greatly impeded. The anatomy of the peripheral anterior synechia is as follows: The iris, instead of going straight toward the pupil from its insertion on the ciliary body, bends away from the pupil, covers the anterior surface of the ciliary body and the pectinate ligament, and then bends back toward the pupil. The anterior synechia is formed by the cooperation of several factors: (1) shallow anterior chamber, caused by the senile increase in the volume of lens, the swelling of the vitreous body and the decreased secretory function of the ciliary body; (2) a dilatation of the pupil, causing a root of the iris to touch the posterior surface of the cornea; (3) the amount of aqueous, inclosed by the root of the iris and the angle of the anterior chamber, which is sucked up by Schlemm's canal and by the iris. The tension in this blocked space drops and the normal pressure in the posterior chamber pushes the iris into the angle of the anterior chamber. This explanation, which was given by Czermak about twenty years ago, is now confirmed by Elschnig.

In acute inflammatory glaucoma the optic nerve shows a swelling, as in cases of neuritis. This swelling is due to imbibition of fluid, which is free of protein, and to hyperemia. The swelling indicates that the pressure in the tissue of the

optic nerve must be higher than the intra-ocular pressure. The fluid which makes the optic nerve swell, must be vitreous fluid to a great extent since any other fluid would contain more protein. Elschnig thinks that under normal conditions a certain amount of fluid leaves the eye by the way of the optic nerve. In the acute inflammatory form of glaucoma, an excavation is not found; the lamina cribrosa is in a normal position or bulges slightly toward the vitreous space. The fibers of the optic nerve are edematous. They stain poorly; small holes appear in the nerve tissue even in early cases. This process of destruction occurs in front of and behind the lamina cribrosa; the fibers are destroyed first, then the glia and the connective tissue is also absorbed. If proliferation of the glia does not take place, real communications between the vitreous space and the retrolaminar part of the optic nerve can be seen. The cavernous atrophy of the optic nerve is always confined to the part which carries the central vessels. The other part of the nerve shows only primary atrophy.

Glaucomatous excavation can be formed with the lamina staying in its normal position or by pushing it backward. This depends chiefly on the permeability of the intra-ocular part of the optic nerve and of the lamina cribrosa. There is one condition (usually glaucoma compensatum) which shows complete atrophy of the prelaminar part of the nerve, rarefication of the lamina cribrosa and cavernous atrophy behind. In this type of glaucoma there probably is a good deal of outflow of fluid through the optic nerve. In other types which are more inflammatory, the prelaminar part is greatly compressed, the lamina pushed far backward, and only partial excavation found. In this condition, considerable glia proliferation is found covering the head of the optic nerve. This tissue makes the optic nerve more or less impermeable. These cases seem to have better prospects. The optic nerves seem able to stand higher pressure for a longer period. This coat of glia in front of the optic nerve seems to be desirable. On the other hand, cases which have always been compensated and do not show any inflammatory symptoms are much more in danger. The outflow of fluid through the optic nerve seems to do considerable damage to the nerve even when the pressure itself is normal. Elschnig compares this destruction with the rarefication of the tissue which forms the scar after a trephine. The glaucomatous atrophy is thought to be caused by pressure and by the histolytic force of the vitreous fluid.

P. C. KRONFELD.

Retina; Optic Nerve

ANGIOID STREAKS OF THE FUNDUS OCULI. F. P. CALHOUN, Am. J. Ophth. **11**:91, 1928.

After a short review of the literature, Calhoun describes a case seen in a physician, a man, aged 35 years. One sister died of glioma (retinal?), one of toxic goiter, one of eclampsia, and one of intestinal hemorrhage. One brother died of a suspected heart attack. One sister had a bilateral disseminated choroiditis. The appearance of the fundi was characteristic of the condition. Retinal hemorrhages were present in the left eye.

The author thinks that the family history points strongly to some familial disturbance of the vascular system. He subscribes to the views of Collins concerning their origin.

ANGIOID STREAKS OF THE RETINA. J. M. GRISCOM, Am. J. Ophth. **11**:95, 1928.

The condition was seen in a negro aged 68 years. Hemorrhages were not visible in the fundi. On the skin of the forehead, the patient exhibited a peculiar irregular,

slate-colored pigmentation diagnosed as chloasma, a pigment proliferation due to neurotrophic influences.

The author suggests that these two types of unusual pigmentation, one in the skin and one apparently in the deeper layers of the retina, may have a common cause which gives rise to proliferation of the epithelial pigment cells in each locality.

W. ZENTMAYER.

THE EMBOLISM OF A BRANCH OF THE CENTRAL RETINAL ARTERY AFTER THE INJECTION OF METARSENOBENZOL. A. VAN LINT, Arch. d'opht. **45**:425 (July) 1928.

Van Lint calls attention to the probable relationship between arsenical treatment and the onset of iritis. Milian described flushing of the conjunctiva frequently accompanied by erythema of the lower lids and tearing. Worms and Gourdille described two cases of severe conjunctivitis, one resulting in loss of the eye and the other in the death of the patient. Sedan reported the case of a patient with transitory paralysis of the right externus which recurred twice. Dupey-Dutemps reported a case of transitory myopia and another in which a sector of the iris was destroyed.

In 1926, Uthoff described a case in which the inferior temporal artery was occluded. The case described by Van Lint is similar. He regards the injection of metarsenobenzol as the cause.

He considers the incidence of accidents of the kind observed too low to justify the abandonment of arsenical treatment. More important is the proper evaluation of the arsenical, iodide, mercurial and bismuth forms of treatment in ocular syphilis.

S. B. MARLOW.

Neurology

FAMILY AMAUROTIC IDIOCY. P. SCOTTI, Ann. di ottal. e clin. occul. **56**:333 (April) 1928.

The first of two cases reported was that of a girl aged 8 months, whose parents were Italians and first cousins. At 4 months of age, the infant showed irregular wandering movements of the eyes, developing into horizontal nystagmus, signs of mental and muscular degeneration and inability to sit up or hold the head up. The cranium became abnormally large. The child seemed to be well nourished. The nerves were atrophic and the characteristic white plaque with a central red spot was present in both macular regions. A bright light apparently could be seen at first; two months later, however, perception of light was abolished and epileptiform attacks had developed. Puncture of the lateral ventricle showed high pressure of the fluid. The Wassermann reaction was negative. A brother, aged 3 years, apparently was normal.

The second patient was a girl, aged 1 year, whose parents were Jewish and not related. Nervousness and constant crying were noticed at the age of 8 months. Soon after, wandering ocular movements and general muscular weakness appeared. Ocular examination showed a condition almost identical with that seen in the first case.

The literature is carefully reviewed, with respect to the clinical picture, morbid anatomy and pathogenesis. The case described was one of the few in which races other than the Jewish were affected. The ophthalmoscopic picture is explained best as the result of a swelling and degeneration of the ganglion cells, which are most numerous in the perimacular region. The thinness of the retina in the macula explains the retention of the red color.

S. R. GIFFORD.

A Case of Ocular Hysterical Syndrome. G. Loddoni, Ann. d'occul. **165**:357, 1928.

A patient who was struck in the left eye by a small piece of iron, complained of a burning sensation of the eye, with severe pain, lacrimation and diminution of vision. After a short sojourn at the hospital blepharospasm of the left eye developed, then mydriasis, and amaurosis. Later, convergent strabismus of the right eye and nystagmus of the left eye appeared. In a few days, small conjunctival hemorrhages of three or four drops began to appear. On two occasions, about one month apart, a small piece of iron was removed from beneath the conjunctiva, exactly where the injury had occurred. The hemorrhages occurred three or four times a day during the month, and ceased immediately when the second piece of iron was removed.

There was a suspicion of malingering, which the other symptoms more or less confirmed. Besides the blepharospasm of the left eye, the patient complained of loss of vision, followed several days later by a convulsive attack of a short duration. This attack was preceded by a severe headache and vomiting. Shortly after, a rotatory nystagmus of the right eye developed, alternating with a convergent strabismus of the left eye.

In hysteria, blepharospasm ordinarily is due to a tonic or clonic contracture of the orbicularis. When an effort was made to open the lids, the eyes would strongly converge. When the lids remained opened, the two eyes would always move in different directions. The converging spasm of the right eye became more intense the more acute the blepharospasm of the left eye became. In the left eye, a fibrillary motion existed. This motion occasionally became vertical or horizontal, then rotary again more often than a true nystagmus. The hemorrhages resulted from the cutting of a small vessel by the pieces of iron, when the patient lay on the left side or from pressure during an attack of blepharospasm. In conclusion, the theory of hysterical autosuggestion is offered as a solution of many of the symptoms present in this case.

H. W. Scarlett.

Tumors

Nevocancer of the Corneoscleral Limbus and Its Metastases: Clinical and Anatomic Study. P. Veil, Arch. d'opht. **45**:506 (Aug.) 1928.

The diagnosis of nevocarcinoma was made by biopsy in a man aged 73 years, who was studied for three years. Treatment with radium was unsuccessful, but extensive excision cured the local condition. Later, recurrence took place in a preauricular gland and the upper lid. Surgical ablation was followed by roentgen therapy which completely destroyed the local condition. The patient died three years later from general visceral involvement. The microscopic appearance of the excised growth is described in detail.

Nevoid tumors of the limbus seem to have a much less serious prognosis than nevocarcinoma of the skin because visceral metastases with melanuria and death from cachexia have been more rarely observed. The case, described by Menetrier and Monthus, of a patient who died two years after enucleation is similar to that reported. In a recent book, Morax states that extensive excision and the sacrifice of the affected eye must be done, whether the patient is young or old, because of the danger of general metastases. Menetrier believes cancer to be purely local in its incipiency and that early excision only can achieve a complete cure.

It is the opinion of the author that enucleation would not have prevented the occurrence of metastases in his patient because they had probably already occurred.

In two cases reported by the author, early excision was done and the patients survived for four years. Veil thinks that a quiescent pigmented nevus should be left alone, but that a progressing epibulbar new growth should be removed without delay. When the globe or orbit is invaded, enucleation is inevitable. Attention is directed to the two cases in which a complete cure was obtained by early local excision.

S. B. MARLOW.

Injuries

PENETRATING WOUNDS OF THE GLOBE: CORNEAL SUTURE OR CONUNCTIVAL COVERING. F. TERRIEN and G. COUSIN, Arch. d'opht. **45**:481 (Aug.) 1928.

The authors present three groups of cases: nine of corneal suture only; five of corneal suture and conjunctival flap, and seven of conjunctival flap only. From the study of these cases, they express the opinion that conjunctival covering alone is the least successful. If the edges of a corneal wound are in good apposition medicinal treatment is favored. If the wound is large and irregular and the edges poorly coapted corneal suture is favored, possibly with a conjunctival flap.

S. B. MARLOW.

Sympathetic Ophthalmia

THE TREATMENT OF PATIENTS WITH SYMPATHETIC OPHTHALMIA. H. VILLARD, Arch. d'opht. **45**:490 (Aug.) 1928.

The clinical record shows that the patient sustained an apparently slight injury to his left eye four months before he was found to have a diffuse cataract and some deposits of pigment on the anterior capsule of the lens. A roentgen examination did not reveal an intra-ocular foreign body. Eighteen months later, or twenty-two months after the injury, the uninjured right eye had become painful and red, due to an iritis. The injured left eye was not painful or soft. After this eye was enucleated, a small metallic foreign body was found in it. Treatment with atropine, cyanide of mercury intravenously and large doses of sodium salicylate was followed by rapid improvement, but nine days later an iridocyclitis of such severity was present that loss of the right eye seemed imminent. In addition to the treatment already instituted, an injection of milk and one of turpentine were given, which resulted in improvement in twenty-four hours. Eight days later, the patient was considered well. A still more violent recurrence, however, followed immediately. The conditions failed to respond to the treatment already employed, supplemented with neoarsphenamine. Two cubic centimeters of a colloidal suspension of silver were injected into the orbit, and 10 cc. intravenously. This was followed by a violent general reaction and improvement. A third recurrence took place and was vigorously treated in the same way. Improvement took place at once and continued rapidly. The vision finally became normal.

The author thinks that the recurrences in this case permit him to compare the various forms of treatment used. His conclusion is that of all the methods employed the most efficient are the use of turpentine for the production of a fixation abscess and the intravenous injection of a colloidal suspension of silver.

S. B. MARLOW.

Operations

RETROCONJUNCTIVAL POSTERIOR SCLEROTOMY IN GLAUCOMA COMPLICATED BY CORNEAL OR CONJUNCTIVAL INFECTION. J. S. FRIEDENWALD, Am. J. Ophth. **11**:111, 1928.

As the title suggests this operation is indicated when infection makes the usual operative approach impossible. The skin surface of the lids can be sterilized

adequately with tincture of iodine. An assistant holds down the lower lid with his finger. The operator grasps the conjunctiva near the lower temporal limbus with fixation forceps. When a large bite of conjunctiva is taken the lower culdesac is lifted up out of the path of incision. A cataract knife with a long blade is introduced through the skin near the lower temporal angle of the orbit and directed toward the equator of the eyeball. As the knife is pointed farther forward than in the usual procedure, it may injure the lens if plunged too deeply into the eye. At first, the blade is entered parallel to the fibers of the orbicularis. When the sclera is reached, it is turned in a meridional direction, then turned through an angle of 90 degrees, to make a T-shaped incision. A collodion dressing is applied to the skin.

POSTERIOR SCLEROTOMY FOR GLAUCOMA. H. FRIEDENWALD, Am. J. Ophth. **11**:107, 1928.

Friedenwald recommends posterior sclerotomy as a preparatory step in other operations, and as a procedure of less danger than other operations in cases of acute glaucoma with an extremely high tension and a tendency to intra-ocular hemorrhage. In some cases of absolute glaucoma, this operation may render enucleation unnecessary. It is indicated especially in cases of glaucoma following injury and subluxation of the lens, and in glaucoma occurring during early childhood. He does not consider that the operation causes serious danger and has not seen a case in which it has done harm.

WEBSTER'S OPERATION FOR ENTROPION OF THE UPPER LID. A. MACRAE, Brit J. Ophth. **12**:25, 1928.

The method described was taught the author by Webster, ophthalmological surgeon in the American College at Beyrout. It resembles the operation of Gifford and of Maher. After suitable aseptic preparation and anesthesia, a Snellen entropion clamp is applied to the lid, the open arm to the conjunctival side and the lid everted. The lid is pulled out until the punctum comes within the opening of the clamp which is then screwed tight. An incision is then made through the conjunctiva and the tarsal plate from end to end, parallel to the margin of the lid and about 3 mm. from it. At each extremity the incision is curved a little forward toward the lid margin but stops short of it. At the inner extremity it should end just external to the punctum. The wound should be inspected to see that no hair roots have been left in the proximal part of the lid. If any are seen they are removed. The clamp is removed and the lid replaced. A strip of mucous membrane is taken from the lower lip, somewhat longer than the skin incision and from 4 to 5 mm. in breadth. The submucous tissue is freed from the graft so that it is difficult to distinguish one surface from the other. It is better to allow the graft to remain on the surface of the finger. The lid is again everted. Any clot which may be in the lid wound is removed and the mucous membrane graft is embedded in the wound, the ends lying in the two curved ends of the groove. The lid is replaced and the conjunctival surface inspected to see that the graft is in position. A pad and a bandage are applied.

W. ZENTMAYER.

Treatment; Medicaments and Treatment

THE USE OF OCULAR CRYOTHERAPY. P. VEIL, Arch. d'opht. **45**:429 (July) 1928.

The author states that Sabouraud and Pautrier were the first to use this form of treatment. Their snow pencil was then replaced by a cryocautery containing a mixture of carbon dioxide snow and acetone. Lortat-Jacob finally popularized

and simplified this instrument. According to Lortat-Jacob, cryotherapy acts by vascular thrombosis, the cellular changes produced by freezing and thawing, and by serous exudation.

Veil refers briefly to the treatment of diseases of the skin of the lids. Small basal cell epitheliomas, warts, mollusum contagiosum, pigmented nevi, milium and xanthelasma are favorably influenced.

He mentions particularly the beneficial results obtained in diseases of the conjunctiva. He treated especially patients with acute and chronic follicular conjunctivitis and trachoma. The application was made with the applicator moistened with 90 per cent alcohol, after the instillation of 4 per cent cocaine. The treatment was not painful and scarring was not seen even after an application lasting from fifty to sixty seconds. Although the results were good in the various types of follicular conjunctivitis, they were less definite in the treatment of trachoma.

S. B. MARLOW.

INFRA-RED IRRADIATION IN THE TREATMENT OF CONJUNCTIVAL DISEASES, ESPECIALLY TRACHOMA. P. NICHELATTI, Ann. di ottal. e clin. occul. **56**:316 (April) 1928.

The author became interested in this subject through observing two cases of a spontaneous cure of trachoma in furnace tenders. The effect of light of different wave lengths is discussed.

Hot packs applied to the lids cannot raise the temperature of the conjunctiva above 43 C. and usually not above 39 C.; they cannot, therefore, have any bactericidal effect. The author used the Paquelin cautery with a large knife-shaped point which was held 0.5 cm. from the conjunctiva for three minutes, and removed occasionally when the patient complained of pain. The temperature of the sac increased to about 46 C. in two minutes, and that of the conjunctiva to about 60 C. From such temperatures an inhibiting effect on bacteria could be expected; also hyperemia and exudation of serum into the tissues.

Complete records are reported in eighteen of eighty cases of trachoma in which this treatment was employed. After from fifteen to twenty daily treatments, most of the patients were clinically cured. Several who were seen two or three years later had not had a recurrence. A minimum of scarring occurred, even in the decidedly hypertrophic cases. Persons with corneal ulceration did well under this treatment. One case of vernal catarrh which had resisted other forms of treatment was greatly improved.

S. R. GIFFORD.

General

THE BEHAVIOR OF THE PUPIL AT THE BEGINNING AND END OF ATROPINE MYDRIASIS. G. SCALZITTI, Ann di. ottal. e clin. occul. **56**:300 (April) 1928.

The author records careful observations on a large series of patients treated with atropine and homatropine. The time before mydriasis commenced varied from six to sixteen minutes. It was not appreciably shortened in those patients who were kept in the dark with their eyes bandaged. It was lengthened from ten to twenty minutes in eyes which were congested from the removal of a foreign body. Age and the presence of cataracts did not have any influence. The time was the same with 1 per cent atropine as with 1 per cent homatropine. In only 8 per cent of the cases was mydriasis regular and equal in all sectors of the iris. In the others, one sector, most often the upper inner sector, was affected first and showed the greatest effect throughout the time of mydriasis. This apparently is the result of an irregular distribution of nerves to the iris.

S. R. GIFFORD.

Society Transactions

EDITED BY DR. GEORGE S DERBY

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

Thirty-Third Annual Meeting, Oct. 15 to 19, 1928

LUTHER C. PETER, M.D., *President*

THE RELATION OF NASAL AND OTITIC PATHOLOGY TO OCULAR DISEASES. DR. LUTHER C. PETER.

The closest cooperation must exist between the otologist, rhinologist and ophthalmologist. Muscular imbalance and uveitis often are due to disturbance in a sinus. In cases of doubt, there should be a frank conference between the oculist, rhinologist and the patient or a person representing the patient. Conservative exploration is valuable, especially when the optic nerve is involved. Unilateral retrobulbar neuritis or neuroretinitis call for the prompt relief from any possible involvement of a sinus. Unless some other point of infection is evident, the sinuses should be the first region to be examined carefully.

In the case of thrombosis of a cavernous sinus, if the infection originated in the nose or ear prompt operative intervention may save the life of the patient. Two types offer hope: in one, the infection begins in the blood stream, and in the other, it comes from the sphenoid, ethmoid or middle ear. Twenty-eight per cent of Dr. Eagleton's cases were from the latter source.

VISUAL PATHWAYS IN THEIR RELATION TO THE DIAGNOSIS OF BRAIN TUMORS. DR. J. F. MCDONALD (by invitation).

The older method of cerebral localization from a study of disturbances in afferent and efferent neural systems of projection will be subject to extension until knowledge of the anatomy and physiology of these systems is complete. This is especially true in the case of the visual mechanism.

A more complete analysis is required as to the details of arrangement and organization of the primary and secondary visual neural fibers, the exact sites of their cortical reception and their higher cerebral indirect connections. Brouwer and Zeeman make a distinct advance in their research on the primary optic neurons and receptive centers of the ape; they consider these sufficiently comparable to those in the human being to justify use, with slight modifications, in clinical work. The authors used the method of localization by a study of the degeneration following circumscribed experimental retinal lesions. They found that the fibers of the optic nerve correspond in position to the retinal quadrants in which they originate. In the optic chiasm the fibers of the upper quadrant remain above, while those of the lower quadrant remain below. In the optic tracts the homonymous fibers of the upper quadrant occupy a dorsomedial position; those of the lower quadrant lie ventrally, without overlapping.

The macular fibers are conspicuous throughout. Just behind the bulb, the fibers are separated from the temporal quadrants and then take an axial position to the chiasm where they cross in a midposition. They finally occupy in the tracts a narrow wedge-shaped medial position, which widens laterally, between the fibers of the upper and lower quadrants.

Knowledge of the detailed organization and reception of the secondary visual neurons is still general, having been localized mainly by clinical methods. In general, there is evidence: (1) that the macular cortical station is polar; (2) that the horizontal retinal lines lie at the bottom of the calcarine sulcus, the vertical retinal diameter lying above and below the area striata which it bounds; (3) that the upper retinal quadrants are projected above, and the lower below, the calcarine sulcus, and (4) that the retinal zones from maculae to periphery are represented in serial segments from the occipital pole forward along the calcarine.

There has been practical progress recently in localization through the development of a finer technic in the use of the perimeter with ophthalmoscopic data. Advance in diagnostic skill is noted in the increased development of ophthalmologic syndromes which definitely localize intracranial neoplasma, such as tumors of the basal frontal and temporal lobe of the brain. Characteristic of a tumor of the basal frontal lobe (when unilateral) is a homolateral, central or cecocentral scotoma with a normal, pale, atrophic or choked disk, associated with normal vision and papilledema on the contralateral side; typical symptoms of a tumor of a temporal lobe, on the other hand, are the development of bilateral papilledema and homonymous defects of the retinal sector of various degrees of width for colors or for form and colors, the latter being caused by the impingement of the neoplasm on the geniculostriate fibers as they curve widely around the lateral ventricle.

AURAL INDICATIONS OF INTRACRANIAL LESIONS. DR. LEWIS FISHER (by invitation).

Careful vestibular examination is particularly valuable in the diagnosis of intracranial lesions. The location and even the extent of intracranial pathologic changes can be determined definitely in many instances by the character of the vestibular reactions. Although the vestibular observations are of great value, they must be considered in the light of the general clinical conditions.

DISCUSSION

DR. ROBERT LEVEY: I have found cerebrospinal rhinorrhea due to an increase in intracranial pressure. In a great many instances, papillitis seems to be relieved by the correction of the intranasal pathologic condition.

DR. ERNEST SACHS: Better visual fields must be taken. Cerebrospinal rhinorrhea seems to be most common in disease of the pituitary body. Operations for acute conditions of the nose are doubtful because of the danger of meningitis. In my experience, meningitis from this source has always been fatal; six cases of meningitis ended fatally following intranasal operations during an acute condition of the nasal tract. Such operations are highly inadvisable unless sufficient time has elapsed for the inflammatory process to be walled off. Focal epilepsy is always due to cerebral irritation; every case of choked disk should be considered of intracranial origin unless definitely proved otherwise. I do not believe that any one can differentiate absolutely between optic neuritis and a papillitis or choked disk.

OPERATIONS ON THE EYE. DR. HARRIS.

Dr. Harris presented a two reel moving picture, demonstrating different operations on the eye.

STEREOSCOPIC METHODS. DR. HARRY GRADLE.

Dr. Gradle showed a series of slides in which the stereoscopic effect was brought out by means of red and green color effects.

THE DIAGNOSIS AND CLASSIFICATION OF CATARACT IN THE ADULT. DR. ARTHUR J. BEDELL.

Certain types of opacity appearing in the lens of a patient who is past middle life may be likened to the graying of hair: they seem to be associated with maturity, and although demonstrable and too often causing reduction of vision, they practically never cause blindness; they are not influenced by treatment and should not be described to the apprehensive patient as cataracts.

Various changes in the clearness of the lens seem to be forerunners of general opacity, particularly of the coronar and dilacerate types.

A large class of progressive cataracts consists of the cuneiform, the dustlike, the posterior saucer layer and the nuclear opacities.

A treatment has not yet been discovered which reestablishes clearness of vision or restores the fiber of the opaque lens to usefulness. Any claim for this result has not been substantiated by photographic proof. Visual function is not a guide as to the process transpiring within the capsule of the lens. The mechanism of vision is complicated, and the clarity of the lens is only one of the many factors involved.

DISCUSSION

DR. CONRAD BERENS: Dr. Berens spoke of some work that he had done in taking pictures of changes in the lens. He showed a number of these photographs.

DR. CLARENCE KING: The knowledge of changes in the lens has been advanced by studies with the slitlamp. More study should be given to the saucer-shaped posterior cortical cataract and to the cataract of tetany.

DR. E. E. BLAAUW: A cataract begins to take place as a separation of the lamellae rather than in the form of water clefts. An important point in the etiology of cataract is the relationship to endocrine disturbances. I am opposed to the conception of cataract as just a senile change.

DR. BEDELL: Opacity produced in the lens can never be restored to transparency.

THE OPERATIVE PROCEDURE IN HANDLING JUVENILE CATARACT. DR. WILLIAM H. WILDER.

For purposes of treatment, cataracts are classified as hard and soft, referring to the condition of the nucleus of the lens.

The nucleus of the lens is seen with the slitlamp microscope. This instrument enables the operator to estimate the size of the nucleus, but does not disclose so well the degree or hardness of sclerosis, facts of particular interest.

Phenomena in the relief of the anterior and posterior surfaces of the nucleus may be an aid. Age is the most important guide. If the patient is less than 25 years of age, the nucleus is probably soft and amenable to treatment by discission and absorption; when the patient is older, the nucleus begins to harden and different treatment is required.

Dr. Wilder gave the principle of treatment of soft cataract by discission and a description of cases suitable for it; he also described the preparations and technic used in this operation and the results obtained.

Supplemental operations are necessary in certain cases to remove the substance of the swollen lens. Indications for the use of linear extraction and the technic of operation were given.

In subsequent discission of the posterior capsule, use of the double needle is valuable if the membrane is tough and dense. Complicated membranous cataracts are congenital and traumatic.

DISCUSSION

DR. ALLEN GREENWOOD: The age of the patient is an important factor in determining the kind of operation required. The type of cataract is another factor. I am in favor of an early operation if the child is blind. The instrument which I prefer is that known as the Ziegler knife-needle. I am opposed to an incision which engages the vitreous. The instrument seems to be introduced best at the limbus. It seems preferable to treat patients with traumatic cataract by linear extraction.

DR. JOHN O. MCREYNOLDS: I wish to emphasize particularly the importance and the gravity of operations on young people. Most work on cataracts is done among persons who are old, whose life is practically finished; these youthful patients, however, have their life before them, and their success depends greatly on the outcome of the operation on their eyes. As the maximal absorption of a cataract is obtained by the incision of the anterior capsule, I am opposed to any interference with the vitreous. All operations should be performed with a minimum of reaction. If a dense membrane remains, it can be divided best with the de Wecker scissors.

DR. WILLIAM A. FISHER: I thought that the procedures that required repeated needlings were now replaced by a capsulectomy, the pupil first being dilated with cocaine euphthalmin, and the operation being followed with an injection of either milk or blood.

DR. E. E. BLAAUW: I am not in favor of iridectomy, or the through-and-through incision. The statistics on blindness show the gravity of this condition, and the serious nature of any operation employed. Zonular cataract should be investigated in relation to internal secretion. I am in favor of early operation on one eye.

The operation devised by Behr consists of a capsulotomy and displacement of the nucleus with the knife needle.

DR. CONRAD BERENS: I have seen favorable results after the through-and-through operation, preceded by iridectomy. Fewer operations are necessary, and the result is obtained without undue reaction.

DR. MEYER WIENER: I am a firm advocate of the Ziegler operation. The operation has not been performed properly when it fails to give good results. The incision must be made in the cornea in order to permit the necessary movements of the instrument.

DR. WILDER: I do not advocate the Ziegler operation. The absorption of the lens fibers is delayed in the presence of the vitreous; then if glaucoma or a similar condition develops, the prolapsed vitreous may be a serious complication. Operations on membranous cataracts by means of the double needle used by Bowman have given particularly gratifying results.

CERTAIN DEBATABLE STEPS IN THE OPERATIONS FOR SENILE CATARACT. DR. ARNOLD KNAPP.

The maturity of a cataract now depends on the depth of the anterior chamber. Extraction is usually successful if a posterior cortical opacity is present. If there is only a nuclear opacity, however, with a perfectly clear posterior cortex, the operation should not be undertaken without estimating the possible complications. Operations to hasten the maturity of a cataract have been abandoned. I am not in favor of a preliminary iridectomy. Iridectomy is done in all cases of senile cataracts because it has certain definite advantages.

Every operator should be familiar with the three ways of dealing with a capsule of the lens: (1) with a cystotome; (2) with capsule forceps, and (3) by intracapsular extraction. There are certain definite indications for the use of each of these methods.

Dr. Knapp then described the intracapsular operation which he uses, and spoke of the results which were published at various times. A report of 200 capsulotomy operations was quoted, and the resultant 26 secondary operations were examined from a number of standpoints. The cause of the subsequent cataracts in these cases was described. Finally, a report was made of the most serious complication, glaucoma, which occurred in 6 cases.

DISCUSSION

DR. HAROLD GIFFORD: In my experience, preliminary iridectomy has not seemed advisable. The extraction is apt to be done before the eye has recovered. I have also abandoned the incision of the capsule at the time of the corneal incision. My results with the cystotome have been good; the model which I prefer was devised by H. Knapp. I am not afraid of capsular tags, and do not believe that any particular attention need be paid to them.

DR. AARON GREEN: It is my practice not to decide on the type of cataract extraction until after the incision is made. Akinesia and deep orbital injection are of great assistance. The section must be made to include more than one-half the circumference of the cornea. The capsule forceps which I prefer to use are those which Elliot devised to remove the disk in trephining. The formation of a horizontal crease in the cornea after the section is a definite contraindication to the intracapsular extraction. If the cornea sinks in after the section, the intracapsular operation can be safely attempted. It is a great mistake to retract the lower lid.

DR. WILLIAM A. FISHER: I consider peripheric iridectomy the best method. It surprises me that any one should condemn the Barraquer operation without any personal experience with it.

DR. OTIS WOLFE: In my five years of experience with it, I have found phacoeresis more difficult than other methods but possessing many advantages, particularly freedom from complications.

DR. ARNOLD KNAPP: Replying to Dr. Gifford, I still feel that the capsular tags are a serious menace. It is probable that Dr. Gifford makes a peripheric or limbal incision; this, of course, obviates or lessens the danger of secondary glaucoma. Replying to Dr. Green, I have not seen the furrow in the cornea after the section, but have noticed a horizontal linear opacity at the time of early dressings, which seemed to be the result of pressure from the upper lid, and which disappeared promptly. Replying to Dr. Fischer, I do not condemn the Barraquer operation, but I found the instrument too complicated. I do not like the finger control. If I were to practice this method, I should prefer Green's apparatus.

A FURTHER STUDY OF THE CULTIVATION OF LENS EPITHELIUM "IN VITRO."
DR. DANIEL B. KIRBY, KEITH ESTEY and FLORENCE TABOR.

In the further study of the characteristics of the epithelium of the lens cultivated "in vitro," it has been possible to verify the experiments and observations previously reported.

Of 294 original explants of the epithelium of the lens, 50 per cent showed signs of active growth.

Of the 294 original explants, 38 per cent survived the second transfer, and 19 per cent the third transfer.

The epithelium of the lens, "in vitro," forms a delicate tissue, which is difficult to handle and transfer.

Despite the difficulties, it is possible to carry a single strain of the epithelium of the lens through unbroken generations by 112 passages over a period of seven months.

The average explant measured 0.25 sq. mm., and the average growth in surface area, 1.75 sq. mm. This gave a relative increase of seven times the original amount.

The epithelium of the lens, "in vitro," is sensitive to the change in inorganic salts in the mediums. It is best cultivated in the mediums containing the normal percentages of inorganic salts. Hypertonic mediums containing from 1 to 1.6 per cent sodium chloride stimulate certain cultures and depress others. From 1.6 to 1.9 per cent sodium chloride is lethal to the cultures. Hypotonic mediums in all but the lowest dilutions have an extreme depressant and toxic action on the epithelium of the lens.

Mediums with a hydrogen ion concentration of p_H 8.2 had an extremely toxic effect on cultures of the epithelium of the lens.

In a certain number of instances, the plasma of the adult chicken was found to contain a factor which was toxic in its effect on not only the epithelium of the lens but other cells.

It is possible to revive certain sick and debilitated cultures of the epithelium of the lens by placing them in normal mediums for several passages.

Certain cultures of the epithelium of the lens after remaining for twenty-four hours at a temperature of 37.5 C. were kept in a viable condition at room temperature for from twenty-four to forty-eight hours. The value of this procedure lies in the possibility of saving the strain when the other cultures become debilitated or die.

DISCUSSION

DR. WALTER R. LANCASTER: The work accomplished in this research is remarkable. Scientific research is always important even though a practical object is not readily apparent.

DR. JOHN M. WHEELER: Dr. Kirby has been fortunate in producing growth in the cells of the lens outside the body.

A CONSIDERATION OF THE LATE OPERATIVE RESULTS IN GLAUCOMA. DR. EDMUND B. SPAETH.

It is proverbially dangerous to draw conclusions from statistics. On the other hand, they are the only basis for scientific deductions, as manifested by the tables promulgated by every insurance company, to use an ordinary example. Conclusions which may be formed in this way are numerous. Unless controversy is desired, however, they must be made with circumspection.

The following deductions seem legitimate and logical:

Trephining is satisfactory for most cases of glaucoma, including all types except that which is secondary to uveitis. The use of anterior sclerectomy is limited by reason of complications and contraindications.

Whereas iridectomy is favored in many cases for acute congestive glaucoma, trephining is practiced equally often for this condition, with even more satisfactory results.

Paracentesis is the basis for the treatment of iritic glaucoma, with the possibility of a subsequent iridectomy.

Trephining, followed later by extraction of the lens, is the logical operation for primary glaucoma complicated by incipient cataract.

An iridectomy followed with extraction is the operation to be chosen for secondary glaucoma with swelling of the lens.

Cyclodialysis has a definite place among the operations for glaucoma in the simple, noninflammatory cases and as part of the treatment following complicated glaucoma; recoveries occur less frequently, as a result, however, than after either of two other operations.

Operations which include the iris call for a careful selection of cases. The results are less dependable than those from other procedures.

Simplicity of technic makes cyclodialysis and inclusion of the iris, when performed by the occasional operator, of less danger to vision.

Posterior sclerotomy has a definite place among operations for glaucoma.

There is considerable uncertainty at present in the field of glaucoma surgery.

DISCUSSION

DR. A. E. BULSON spoke of the defects of trephining, and of the favorable results recently obtained with iridotasis.

DR. E. C. ELLETT: It seems to be a mistake to perform any operation in acute glaucoma, other than an iridectomy; otherwise I prefer trephining, in which I have not observed any late infections.

DR. BLAAUW: A Lagrange operation combined with iridotasis has its advantages. The disturbance in the sense of light is an important symptom in glaucoma; this can be determined easily with the aid of a smoked glass.

DR. ALLEN GREENWOOD: After encountering cases of late infections, I replaced trephining with iridotasis and the Lagrange operation.

DR. HAROLD GIFFORD: The danger of late infections can be minimized by proper care of the eyes on the part of the patient. I prescribe zinc chloride drops, 1:500.

DR. HARRY GRADLE: There were definite indications for the use of cyclodialysis in less urgent cases, those just across the borderline from miosis. This operation is not a cure-all; the less reaction there is present, the better prospect there is for a favorable influence on the tension. In view of the danger of prolapse of the iris, why should the operator deliberately run this risk by performing iridotasis?

CHANGES OF REFRACTION IN AGE. DR. EDWARD JACKSON.

Dr. Jackson, the guest of honor, enumerated the changes in refraction that occurred in a large number of patients whom he divided into groups according to age. The most important and regular change seemed to be the changing of the axis of astigmatism from the position of with the rule to that of against it.

PRESENTATION OF NEW INSTRUMENTS.

Dr. W. C. Baine presented a trial frame; Dr. Otis Wolfe, a forceps to use for suturing the conjunctiva; Dr. S. B. Muncaster, a trial frame and Dr. D. B. Kirby, eye instruments with uniformly rounded, cylindric handles.

LIGHT THERAPY IN OPHTHALMOLOGY. DR. S. R. GIFFORD.

Fifty-three patients were treated with the Birch-Hirschfeld irradiation lamp, and twenty-eight with the Kromayer lamp.

Beneficial effects of phototherapy, especially that with ultraviolet light, may be explained in four ways: by a direct bactericidal effect; by stimulation of the epithelium; by improved nutrition from the hyperemia produced, and by an increase in the antibodies of the blood.

General light baths with the mercury vapor arc are of great benefit with phlyctenular keratitis and with ocular conditions which are the result of tuberculosis.

Local phototherapy is of benefit in cases of corneal ulcer, tuberculosis of the cornea and conjunctiva, trachoma and blepharitis.

In treating patients with diseases of the cornea, the Birch-Hirschfeld carbon arc with a uviol filter and quartz lenses is safe and convenient, and does not produce any unpleasant reactions.

Herpetic lesions show the most marked effect of this treatment; some of them heal after one or two treatments.

Epithelial dystrophy apparently is benefited; in all the early cases observed the condition healed under treatment, and more rapidly than in those patients treated by dionin alone.

In several cases of sclerosing keratitis, distinct improvement followed phototherapy.

Marked results were not seen in serpent ulcers in this series. Reports, however, would seem to justify a trial of this treatment, especially in early cases; other forms of treatment should not be neglected. The length of treatment might well be increased to ten minutes twice a day.

The use of the Birch-Hirschfeld apparatus in the series did not disclose any harmful effects.

For tuberculosis of the conjunctiva and cornea, use of the Finsen light with special quartz applicators is probably the best form of treatment; the Kromayer light is also of great value.

The Kromayer lamp has proved of value in treating patients with chronic conjunctivitis, blepharitis and deep hordeola. With a standardization of technic, it may effect a considerable advance in our treatment of trachoma.

Phototherapy should be tried in diseases of the cornea which do not yield to ordinary treatment, such as Mooren's ulcer.

DISCUSSION

DR. LAWRENCE T. POST: In my use of light therapy for two years, I have experimented with a number of cooling solutions, and have found that distilled water works as well as any, although at present I do not use any cooling solutions. The method appears to be of value particularly when it is used as an adjuvant with other treatment. Results were not obtained in iritis, except in one case of scleritis. Experiments on animals which were inoculated with tuberculosis of the iris gave negative results; the process in the iris was not inhibited. In the European clinics, general light treatments in addition were used with benefit. The best results were obtained in herpes of the cornea. In corneal complications in trachoma and in interstitial keratitis the results were uncertain. Corneal scars did not yield results. The patients with mild cases of vernal catarrh were benefited.

DR. C. W. RUTHERFORD: The fact that the apparatus is extremely expensive makes too general use of it inadvisable; it would be better to wait until exact indications are obtained.

DR. W. H. CRISP: The thermophore provides a simpler method of applying treatment. Excellent results have been obtained with fractional doses of x-rays, one third of an erythema dose.

DR. S. J. BEACH: The skepticism regarding light treatment is ill founded. I have seen good results from this treatment in recurring scleritis; on the whole, I am favorably impressed with light therapy.

DR. MUNCASTER: The temperature of the patient should be carefully observed. In one case I found it to be greatly reduced.

DR. GIFFORD: The best results seem to be obtained in herpes and in ulcers of the cornea. In blepharitis the Kromayer lamp was necessary.

THE FREQUENCY OF INTRA-OCULAR HEMORRHAGES IN THE NEW-BORN AND THEIR RELATIONSHIP TO INTRACRANIAL TRAUMA. DR. MAX W. JACOBS.

This is a report of a paper, read in 1924, on retinal hemorrhage in the newborn. A recent study of the eyes of these children, who range in age from 3½ to 5½ years, did not show impairment of vision as a result of the retinal hemorrhages found at birth. Intracranial injury at birth, on the other hand, with or without hemorrhages, is a much more serious matter. To trace a relationship between intracranial trauma and hemorrhage and intra-ocular bleeding, a series of premature and stillborn infants were examined. Of fourteen children examined, all showed intra-ocular engorgement or hemorrhage. Twelve pairs of eyes had retinal hemorrhage. Twelve infants had been delivered by spontaneous labor. The only instance of a complicated birth was one which required high forceps. This infant showed an intracranial injury as well as large choroidal and retinal hemorrhages. Six cases were breech presentations. No greater amount of intra-ocular hemorrhage occurred in these than did other types of presentation. The striking fact disclosed in the data collected is the large percentage of retinal hemorrhages. The suggestion that hemorrhages in the premature infant may be due to some vascular weakness is not borne out in this piece of work. A study of all the factors involved would not seem to show any one of them responsible for simultaneous intra-ocular and intra-cranial hemorrhages.

DISCUSSION

DR. PARKE LEWIS: The subject is important. A joint study should be undertaken to determine the necessity for cesarean section in complicated cases.

DR. JACOBS: In later observations, hemorrhages in the retina were not shown to influence or harm vision subsequently, unless they were exceptional in amount.

TRAUMATIC PROLIFERATING CHORIORETINITIS. DR. ELMER P. WEIH.

During times of peace, this condition rarely is seen. A boy, aged 15 years, was shot with a 22 caliber rifle. The point of entrance was in the right temple; a point of exit could not be found, but the bullet could be felt in the left temple. When the hemorrhage in the eyeground had cleared up sufficiently to permit an examination, a large tear could be observed in the retina of the right eye; it extended upward and inward with much pigmentation. Much of the outer and upper quadrant of the fundus is a white membrane with irregular blotches of pigment in it. The fundus of the left eye in this case showed a large irregular blotch of black pigment in the upper and outer part with this white membrane showing through it here and there. Traumatic proliferating chorioretinitis always follows a hemorrhage and a rupture of the inner membranes. The fibrous patch is of more regular thickness than the basic tissue, and is opaque everywhere. It does not extend into the vitreous, but is proximate to it. It has a smooth and even surface without any distinct prominence. It is located more frequently in the macula, disk and adjoining parts. It is not accompanied by detachment; on the contrary, the proliferation binds the retina to the choroid. Foci of pigmentation are frequent.

All authors seem to agree that, in addition to changes of the inner coats of the eye, newly formed connective tissue is found. This tissue, which forms a thickening, is in part degenerated hyalin, and contains pigment cells and free pigment. The remaining portions of the retina are covered on both sides by scar

tissue. Retina and choroid in places are united by scar tissue into one coat in which lumps of pigment are found. The rest of the retina contains pigment which probably is derived from the pigmented epithelium.

At the edge of retinochoroidal ruptures, retinal duplications are found. These may extend over the head of the optic nerve and manifest themselves by a contortion of the vessels and formation of vascular curves. Meller emphasizes the traumatic necrosis of retina and choroid, both of which are then supplanted by the thickening, scarring process.

Diagnosis of chorioretinitis proliferans traumatica usually is not difficult. The type of trauma generally points to the correct interpretation of the observations which may resemble those in classic proliferating retinitis. In the latter, however, destruction of the choroid does not occur, and the pigmentations are much less prominent. In exudative retinitis, the white sections are always below the retinal vessels, and choroidal changes or pigmentations are not visible.

DISCUSSION

Dr. Charles A. Bahn: It is important to differentiate between an injury from concussion and a direct injury to the eye.

Dr. Bedell: Dr. Bedell showed a number of photographs of eyegrounds with allied conditions.

Retinal Hemorrhage as an Expression of Vicarious Menstruation. Dr. Clarence Loeb and Dr. S. J. Meyer.

Vicarious menstruation is of rare occurrence. A patient developed a retinal hemorrhage at the time of menstruation. The fundus showed small black spots which suggested previous hemorrhage. The diagnosis of retinal hemorrhage due to vicarious menstruation is open, of course, to objection. There was, however, in this case, a history of periodic monthly headaches of short duration, occurring at the time of menstruation which was always delayed and painful. There were, moreover, normal physical observations, normal refraction and a normal personal history. A causal relationship, therefore, between the evidently abnormal menses, the presence of blood in the retinal tissue and the evidence of previous retinal hemorrhages, seemed to exist, sufficient to justify the diagnosis of retinal hemorrhage due to vicarious menstruation.

DISCUSSION

Dr. W. H. Crisp: I have not had any experience with this condition. I wonder whether the term is not applied too loosely; the hemorrhage may be due possibly to other causes.

Clinical Studies in Slitlamp Ophthalmoscopy. Dr. Jonas S. Friedenwald.

The slitlamp magnifying hand ophthalmoscope that I use possesses the two following characteristics: (*a*) The illuminating beam which casts the image of a narrow slit on the retina can be directed obliquely to the axis of observation, so as to provide oblique focal illumination of details of the fundus, analogous to that obtainable in the anterior segment of the globe with the slitlamp corneal microscope. (*b*) The definition of the ophthalmoscopic image is heightened by the suppression of its chromatic aberration either through the introduction of appropriate color filters into the illuminating system or through the use of an achromatizing lens in the observing system; the image so sharpened may be magnified

with the aid of a small telescopic ocular. By these means, certain ophthalmoscopic details may be seen which are not recognizable with other instruments. With the aid of this instrument, the three following conditions can be studied: (*a*) cystic degeneration of the macula, (*b*) serous transudates near the optic disk, and (*c*) subretinal exudates and detachment of the retina. (This paper is to be published in full.)

DISCUSSION

DR. ROBERT VON DER HEYDT: With the red free light, I have been able to demonstrate the anterior wall of the cyst.

The image disclosed on the retinal surface in contour, through the slit, is important.

DR. HARRY S. GRADLE: The use of the Koeppe method with a contact glass presents difficulties.

DR. FRIEDENWALD: Cystic degeneration either is traumatic or occurs in chronic iridocyclitis or arteriosclerosis. The contact glass is difficult to use. I think that another objection to this instrument is that the increased spherical aberration causes the definition to be less.

THE FORMATION OF THE AQUEOUS HUMOR: ITS RELATION TO INTRA-OCULAR AND VASCULAR PRESSURES. DR. ARTHUR M. YUDKIN.

It is my impression that the intra-ocular fluid is a dialysate of the blood plasma in the sense that there is a membrane, covered by a capillary wall and tissue. This membrane has a functional adaptation to keep the fluid of the eye transparent and to help regulate the slow continuous process of metabolic and catabolic exchange on both sides of the membrane, so that a delicate balance is established between the hydrostatic and osmotic pressures of the arterial and venous plasmas within the eye. This balance is the intra-ocular pressure. There is a continuous circulation of the intra-ocular fluid in the eye. The rate of circulation depends on the metabolic exchange and the muscular reaction of the surrounding tissue.

DISCUSSION

DR. HARVEY D. LAMB: The history of observations on the aqueous is important in the study of glaucoma. I have observed cysts in the ciliary epithelium following paracentesis of the eyes of rabbits.

DR. HENRY P. WAGENER: Duke-Elder's estimation of the pressure in the intra-ocular capillaries is considerably higher than that found by Seidel and Baillart; Seidel claims that the pressure is too low to allow of filtration from the blood stream into the eye. I believe that Baillart's figures are nearer correct, and that clinical observation indicates an active circulation of the fluids. The volume of the vitreous is important in the intra-ocular tension. The vitreous is a gel; its volume is influenced by the hydrogen ion concentration of the blood.

DR. YUDKIN: I hope that a study of the aqueous may reveal something about the pathogenesis of cataract and glaucoma.

THE OPTICAL CORRECTION OF CONICAL CORNEA WITH THE CONTACT GLASS. DR. DONALD H. O'ROURKE.

Of the different optical devices employed in the effort to improve vision in keratoconus, the Zeiss contact glass is the most successful. This glass is ground to fit the sclera and is made in three sizes, to correspond with various degrees of the condition. The difficulty with which the glass, filled with salt solution,

was placed in position was overcome by this device: A wash bottle with a bulb was connected with a tube covered by rubber-dam with one perforation. The contact glass was held on this tube by negative pressure, and the patient inserted it himself by bending over the tube. In one patient vision was improved from 6/30 and 2/60 to 6/12 and 6/20, and the contact glasses were worn daily without trouble.

DISCUSSION

DR. E. E. BLAAUW: It is important to examine patients with keratoconus for endocrine imbalance. I had two patients whom I treated with thymus extract. In one case, the use of contact glasses improved vision from ability to count fingers and 2/60 to a reading of 6/9 in each eye. An operation should never be undertaken until contact glasses have been tried.

DR. EDWARD JACKSON: A general examination is necessary in these patients. I saw one in whom a thyroidectomy apparently helped to stop the progress of the condition. This patient used the contact glass with great benefit.

DR. ROBERT VON DER HEYDT: In three cases of keratoconus, contact glasses were either not used or refused. In one, they improved vision from 20/100 to 20/40, but were not tolerated; in another, vision was improved from counting fingers to 20/60. In the third patient, vision improved from 4/200 to 20/30; this patient wears his contact glasses successfully.

DR. O'ROURKE: I have found normal physiologic sodium chloride solution the best fluid for use in the contact glass.

SUTURE FILTRATION IN GLAUCOMA SIMPLEX. DR. GRADY E. CLAY.

A large conjunctival flap is made; the keratome is passed into the anterior chamber from a point 3 mm. behind the limbus, and a broad iridectomy is performed. A silk suture is passed through the distal lip of the wound and the loop is left in the anterior chamber until the tenth day. Control of tension was possible by this means in seven patients, without complications.

DISCUSSION

DR. H. W. WOODRUFF: Mere iridectomy is valuable in glaucoma simplex, if the root of the iris is included.

Torok draws down the iris with forceps before cutting it off close to the root.

DR. CLAY: I believe that the broad area of subconjunctival filtration resulting from this procedure is an important element in safety from late infection.

FRENCH SOCIETY OF OPHTHALMOLOGY

DR. ONFRAY, *Reporter*

Annual Meeting, May 12-14, 1928

From the *Annales d'oculistique*, July, 1928

ORIGINS OF OFFICIAL TEACHING OF OPHTHALMOLOGY IN THE FACULTIES AND SCHOOLS OF MEDICINE IN FRANCE. H. TRUC, Montpellier.

The first official teaching of ophthalmology occurred in France and not in Germany; the chair at Vienna was created in 1772 by Marie-Thérèse and the one at Paris in 1765 by Louis XV. The one at Montpellier dates back to 1788, the time of Louis XVI.

The first contemporary teaching of ophthalmology in France is that of Victor Stoeber at Strasbourg in 1829, with hospital service in 1845 and mixed chair in 1835.

The first special chair of the ophthalmologic clinic in France was created at Lyon, for Gayet, at the time of the constitution of the Faculté de Médecine in 1877; the second, for Panas, at Paris in 1879; the third, for Badal, at Bordeaux, in 1882; the fourth for De Lapersonne, at Lille, in 1889, and so on.

LEGIBILITY WITH REFERENCE TO DISTANCE AND TIME. FROGÉ, Amiens.

In order that a text can be quickly legible at a great distance, it should be written in ordinary yellow letters (small and not capital) on a blue background; the letters should be well differentiated in their upper parts and widely separated from each other.

LACRIMAL AUTOPLASTY BY DERMO-EPIDERMIC GRAFTING. P. JEANDELIZE and R. BAUDOT, Nancy.

Six cases are reported of autoplasty of the lacrimal canals by dermo-epidermic grafting, with a rubber drain from 3 to 4 mm. in diameter for support. The results are encouraging. This procedure is indicated in cases of traumatic section of the inferior canaliculus with or without ectropion, and in the course of a plastic dacryocystorhinostomy (failure in only about 5 per cent of the cases); ablation of the sac should follow, in order to reestablish the course of the tears, etc. The value of making the section destined for the introduction of the grafting on the level of the conjunctival angle and not on the commissural edge of the eyelids is emphasized. The first operations of this kind were practiced by Morax and Valière-Vialeix.

DISCUSSION

A. TERSON, Toulouse: In the remarkable communication of Mr. Jeandelize I noticed one detail. He puts the cutaneous incision 1 cc. from the commissure. Long ago I suggested an incision "omnibus," for all operative intervention on the sac which avoids the "annoying" hemorrhage of which so many authors speak. It suffices to make an incision 3 or 3.5 mm., 4 at the most, from the internal commissure. Nothing is more simple than to measure with the bistoury placed flat, the back graduated if necessary. On several cadavers and on many living persons I have always just struck the sac, and never the vessels. In the light of extensive experience, I can affirm, no matter what people say, that this mark is the most precise and most practical of all.

PREVENTION OF ACTINIC CONJUNCTIVITIS OF CINEMA ARTISTS. VIGOUROUX.

Actinic conjunctivitis is a relatively mild disease, but with repetition it can cause various troubles; one can observe chronic hyperemia of the conjunctiva and early presbyopia among those who are frequently attacked.

It is feared that the studio lights cause grave accidents among the artists, which are due to injury from the ultraviolet rays. These accidents should be avoided at their source by glass screens placed before the arc lights and projectors. These screens, sufficiently thick and surrounding the frame of the lamps, will block the totality of ultraviolet rays and prevent actinic conjunctivitis.

RADIUM TREATMENT OF SPRING CATARRH. CASTRESANA, Madrid.

Six patients with spring catarrh were treated by radium. From the results it is concluded that: (1) by means of radium one can obtain an amelioration or

even a disappearance of subjective troubles in most patients. (2) Radium has more effect on perikeratic formations than on tarsal lesions. (3) On the latter, in a patient whom I treated, radium was not efficacious.

EXPERIMENTAL TUBERCULOSIS OF THE CORNEA. L. CARRÈRE, Montpellier.

This article will be published in full.

ULCEROUS KERATITIS IN HEREDITARY SYPHILIS. A. TERSON, Toulouse.

The ulcerogummatous syndrome in hereditary syphilis is rapidly influenced by intensive antisyphilitic treatment, much more so than Hutchinson's parenchymatous keratitis. This syndrome ought to become classic as a definite exception to the ordinary diffuse keratitis without ulceration. Moreover, one should look for syphilis, hereditary or acquired, in all ulcers of the cornea.

Hereditary syphilis, ozena and lacrimal conditions make infected ulcers liable, but others, such as Mooren's ulcer and certain atonic ulcers, can have an indirect or associated syphilitic origin, for example, an ulcer of the legs. Prudent antisyphilitic treatment will always be usefully associated with appropriate local treatment.

In acquired syphilis, keratosyphilitic ulceration is exceptional. Deep parenchymatous keratitis, obstinately unilateral, and necrotic neuroparalytic keratitis are less rare syndromes in cases of acquired syphilis.

PENETRATING WOUNDS OF THE EYEBALL. CORNEAL SUTURE OR CONJUNCTIVAL PLASTIC OPERATION. TERRIEN and COUSIN, Paris.

Without wishing to draw too hasty conclusions from the examination of the operative prognosis of twenty-one penetrating wounds of the anterior segment of the globe, it seemed opportune to draw the attention of all ophthalmologists who are interested in this question to the results of our first investigations on the various operations that have been employed up to this time.

A conjunctival plastic operation by no means protects the eyeball from all infections — especially not from the one which should be feared most, iridocyclitis. In the past five years at the ophthalmologic clinic of the Hôtel-Dieu only one case of sympathetic ophthalmia was observed, namely, that reported by Mlle. Oswalt in her thesis on a wounded man, who had had a conjunctival plastic operation performed after a penetrating corneal wound. On the whole this method has given little success.

There remains the suture alone, with or without the subconjunctival injection of mercury, and the suture with a conjunctival plastic operation. These procedures are equally worthy of recommendation.

From this standpoint it is well to modify the directions usually given for the treatment of penetrating wounds of the globe. Slight wounds of the cornea with perfect coaptation of the edges should be treated medically; cauterization with tincture of iodine, the administration of disinfecting salve or eyedrops or subconjunctival injection, if necessary, should be used. If the wound is deep, it is necessary to make a suture of the cornea after the edges of the wound are adjusted. If it is thought necessary, a subconjunctival injection should be made. The operation can be completed by a conjunctival plastic procedure.

KERATOMALACIA AND BLUE LIGHT. G. BOREL, Neufchâtel.

Radiotherapy in ophthalmology is successful in cases of tuberculosis or in superficial tumors, but it has also caused some terrible misfortunes — radiokeratitis,

all the more serious because it frequently comes late, the incurable sequel beginning insidiously with the loss of eyelashes and eyebrows, chemosis, adhesions of the eyelids; afterward iritis with hypopyon, corneal necrosis and optic atrophy.

Now that solar radiations are admirably tolerated by the mucous membrane and conjunctiva of ectropionized eyes, as Rollier and Borel pointed out in primary tuberculosis of the conjunctiva (*Revue Médicale de la Suisse Romande,* 1912) that the extreme ultraviolet, infra-red, caloric and roentgen-ray radiations should be handled with extreme prudence because idiosyncrasies exist.

The rays of the spectrum from 670 to 1,400 millimicrons rapidly produce hyperemia of the retina with the formation of cystoid spaces and atrophy of the choroid (Vogt). As a cause of lesions, the roentgen rays occupy an intermediary place between the infra-red and the ultraviolet rays which produce circulatory or destructive lesions of the tissue. The caloric rays produce cortical cataract just as the roentgen rays.

A case was cited of keratomalacia after several exposures to the roentgen rays, the cornea growing soft and undulating at the least pressure; chemosis, ptosis, iritis, loss of hair and opaque cornea occurred.

As there is antagonism between radiations of great wave length (infra-red) and radiations of short wave length (ultraviolet), as has already been pointed out by Becquerel for phosphorescent substances, the light which they emit under the influence of ultraviolet rays can be extinguished by radiations of infra-red. One can recur to this physical law in cases of ocular burns which result from radiotherapy. Rosselet of Lausanne proved that the same law of antagonism of extreme radiations takes place in the ionization of air.

A lesion produced by rays of short wave length, such as the roentgen rays, can be ameliorated by rays of great wave length, as the blue rays.

This antagonism of extreme rays, shown by Pech de Montpellier in 1920, and by Dufestel of Paris (l'antagonisme des radiations et son importance en pratique actinologique, 1926), would arrest the corneal necrosis, while allowing a thick pannus to persist.

The technic of this cure by means of blue rays should be developed, and Rosselet's idea can be both fertile and useful.

ANATOMOCLINICAL STUDY OF A CASE OF NEVOCANCER OF THE SCLERO-CORNEAL LIMBUS AND OF ITS METASTASES. PROGNOSIS AND THERAPY OF THE NEVOCARCINOMA OF THE BULBAR CONJUNCTIVA AND OF THE LIMBUS. PROSPER VEIL.

A man, aged 75, developed a nevocancer of the sclerocorneal limbus of the right eye; it was as large as a nut and adhered to the sclerotic after a biopsy had been done for histologic diagnosis. Radium treatment was applied without effect.

The tumor was removed surgically and did not return, but three months later there appeared a preauricular swelling which was removed by exeresis; it was nevocarcinomatous. Penetrating radiotherapy applied on the level of the preauricular region prevented a return; six months later the patient developed a tumor of the upper eyelid, which invaded the tarsus. The tumor was removed surgically; submaxillary and parotid swellings were present. Penetrating radiotherapy of the palpebral parotid and submaxillary regions caused the definite disappearance of these adenopathies. The patient died of visceral metastases three years after the beginning of his illness, without having suffered a repetition of his ocular, palpebral or glandular troubles.

After a histologic study of the tumor and of the different metastases, I studied the prognosis of nevoid tumors of the limbus. Two subjects were operated on for carcinomatous tumors more than four years ago, and the cure is complete

and definite. The prognosis of a progressive but mobile nevocarcinoma, which had been removed, remains favorable; deep excision of an adherent nevocancer, followed by electrolysis or galvanocautery, can lead to complete cure. Enucleation is necessary in case of endocular penetration or orbital invasion.

DISCUSSION

A. TERSON: I have observed about ten patients with conjunctival pigmented nevi, on whom I operated by deep excision and thermocautery. The prognosis with operation in similar histology is highly variable. Twenty-six years ago, I operated on a great printer; he has experienced neither recurrence nor metastasis. Of the other patients, some have disappeared from observation, and some have not had enucleation performed and are able to read after having had two or three intervening attacks. One of them, the son of a man who had cancer, had a nevus at the age of 40. In spite of several operations, his eye was saved. Fifteen years later, he developed a cancer of the rectum.

Even early enucleation does not seem to prevent metastases. Are the latter numerous in such a case? Is the use of diathermy superior to the older treatments? Is it more elective? I should like to be enlightened on these questions.

BIOMICROSCOPY OF THE ANTERIOR CHAMBER OF THE IRIS AND OF THE CILIARY BODY. JACQUES MAWAS, Paris.

Biomicroscopy or examination of the eye during life with the binocular microscope combined with Gullstrand's slit lamp is being used more and more extensively. The French Society of Ophthalmology, which published the remarkable report of Gallemaerts on diseases of the cornea two years ago, completes it this year by this report on the anterior chamber of the iris and the ciliary body.

Attention is called to the fact that the first ocular microscopes were manufactured and used in France, in the time of De Wecker, Gayet and Liebreich. The first memoirs on the histology of the eye during life were published in the accounts of the Academy of Science by A. Waller, in 1865.

Microscopy of the eye during life, which is only histology without fixation or coloration, will not attain its full value until it is controlled and completed by histology of the laboratory. In turn, the latter will benefit by discoveries made on the eye during life. Biomicroscopy is not only histology during life, it is also an introduction into the study of physicochemical ophthalmology, for the three transparent media of the eye are colloids; aqueous humor is a colloidal solution, the lens is a gel and vitreous humor is a hygrophilous colloid.

Biomicroscopy of the Anterior Chamber.—The anterior chamber is not optically empty. This is proved by the fact that the aqueous humor is a liquid which in its normal state holds in suspension particles of extreme fineness which reflect the light. The opalescence of the aqueous humor is due to its small albumin content. The depth of the anterior chamber varies with age, refraction and accommodation. Biomicroscopy permits one to become better acquainted with these variations and to measure them. In a pathologic state the variations in depth of the chamber are considerable, but they never reach zero.

The aqueous humor contains some white migratory cells, especially in small children. Most of these elements are fastened to the posterior surface of the cornea. When the cells are numerous they generally occupy a line situated in the center of the posterior face of the cornea, the superior extremity of which corresponds to the inferior edge of the pupil (Ehrlich-Türk's line).

The aqueous humor is in perpetual movement. A continuous current is produced in the following sense: the humor rises in front of the iris and descends behind

the cornea. This current results from the difference in temperature which exists between the cornea, constantly cooled by the external medium, and the iris, the temperature of which is almost equal to that of the rest of the body. The rate of the current of connection is 1 mm. every three or four seconds. The viscosity naturally modifies the rapidity of the current.

The amount of albumin, which is increased in infections, retards the current; if the amount reaches 2 per cent, the current stops.

Pathologic aqueous humor is a colloidal solution which becomes illuminated in the passage of light rays, and this all the more clearly because of its greater content of albumin. Biomicroscopy in this case becomes a nephelometry on the eye during life, and puts in evidence the following principal modifications: cloudy disorders and granular changes with fibrinous filaments resulting from inflammation of the iris and the ciliary body.

The study of the formation of precipitates in the aqueous humor and their adherence to the posterior face of the cornea is considered from the physicochemic point of view; the superficial tension, the electric state of the membranes and the ionic concentration of the medium affect flocculation and adherence of the precipitates to the posterior face of the cornea.

In contusions and traumatisms of the globe, biomicroscopy is the only way to reveal the uveal débris in suspension in the aqueous humor as well as the red cells.

Gonioscopy, or the study of the angle of the anterior chamber, was studied in a complete fashion and the technics of Salzmann, de Koeppe and d'Uribe Troncoso were described in detail. Gonioscopy is at all times a difficult technic and is not easy to use in practice, just like ultramicroscopy and spectroscopy of the eye.

Biomicroscopy of the Iris.—If one considers the iris schematically as a ciliary process spread out on the surface, one will understand what a great opportunity is given for the study of this part of the choroid by the microscopic examination of the eye during life.

Aside from that which belongs to it in its own right, the localization of diverse infections and special alterations, the iris shows at times in a striking manner either a profound organic deficiency or an unknown lesion of the choroid or of the neurovegetative system of the eye, belonging to the neurosympathetic system. The importance of biomicroscopy is to reveal these lesions at their beginning.

After the normal iris was studied as to structure, color and vascularization, the study was begun of congenital anomalies, those of congenital diseases, followed by postfetal development and, finally, those of senile alterations, which one should be able to recognize in order not to confound them with pathologic lesions.

The traumatic lesions of the iris are divided into: (1) lesions consecutive to traumatism of regions adjacent to the globe or lesions caused by concussion; (2) direct traumatic lesions and foreign bodies; (3) chemical heterochromia (siderosis and chalicosis, and (4) postoperative lesions. Tumors of the iris were then studied, and here, too, is shown the importance of biomicroscopy in the diagnosis of these tumors; for example, a benign tumor (angioma) which was removed by iridectomy instead of by enucleation.

Diseases of the iris with their consequences, heterochromia by atrophy of the stroma and pigmentary disintegration precede the study of nonspecific nodular formations, specific nodular formations with known and unknown germs, atrophic scleroses, the posterior epithelial iris, vascular lesions and tumors, without forgetting lesions due to irradiation.

The third part of the report, which concerns the ciliary body and the zonula, is short. The study of the ciliary body has just been begun; that of the zonula has confirmed what recent histologic works have made known.

DISCUSSION

LEMOINE, NEVERS: I agree with the reporter in his criticism of the instrumental vocabulary generally employed, and in particular the expressions, "corneal microscope" and "examination by slit lamp." Why not designate by the name biomicroscope the instrument necessary for biomicroscopy, and speak of examination by biomicroscope just as one speaks of examination by ophthalmoscope?

Without transforming his report into a general review of iridic and ciliary pathology, it would have been well for Mawas to have insisted more on the pathologic side and on the practical side of certain examinations by the biomicroscope. Is it not interesting, for example, to subject the Argyll Robertson pupil to a biomicroscopic examination? It furnishes a way to make exact observations in well defined conditions. Moreover a certain number of patients classified as having the complete Argyll Robertson pupil still show a definite iridic reaction.

Finally, the contraction of the diseased iris is instructive to observe, for it is produced in different ways, according to the subjects: in some, it is transmitted over the whole surface of the iris; in others, it is limited to the sphincter, and in some it takes place only in a sector.

ATROPHIC PLAQUES OF THE IRIS. JEANDELIZE and BRETAGNE, Nancy.

In an old amblyopic eye which also suffered from glaucoma, a characteristic lesion of the iris was observed. It consisted of four white strands which could be clearly seen below the plane of the iris with the corneal microscope.

The outline of the radiating figure in the iris could be readily seen with the microscope; certain tracts were visible and contained a vessel in which it was not possible to discover an active circulation. On Descemet's membrane and solely opposite the white strands, there was an accumulation of brown pigment of a color comparable to that of the iris.

On evacuation of the anterior chamber, adhesion of the anterior layer of the iris to Descemet's membrane was caused, and when the chamber was reestablished, the pigmented layer remained stuck to Descemet's membrane, thus causing the white spaces in the iris and the pigmented deposits on Descemet's membrane.

BIOMICROSPOPIC ASPECT OF A CONDITION MET IN CERTAIN BLUE IRISES. BRETAGNE, Nancy.

In certain blue irises, close to the limbus and concentric to it, one encounters little yellowish white elevations, like a string of beads, varying in number and in distribution. With the appearance of microscopic gummas, they do not seem to have any pathologic significance. They are, no doubt, accumulations of chromatophores, the nature of which a histologic examination would reveal.

REMAINS OF PUPILLARY MEMBRANES. RENÉ ONFRAY and MARGERIN, Paris.

Biomicroscopic drawings were shown of remains of pupillary membranes adhering to the posterior surface of the cornea. This condition is probably due to cicatrices following intra-uterine iritis.

VERRUCOSE HYPERCHROMIC IRIS. KOBY, Bâle.

Coats and Collin have called attention to a warty condition which a hyperchronic iris sometimes shows in heterochromia through hyperpigmentation. This case is an example of it, especially as the changes are bilateral. On each iris there are several hundreds of little papillae. From most of these warts radiate folds which are often in connection with the adjacent ones. The elevations are especially numerous in the ruffle region of the iris.

The pathogenesis of this condition is obscure. It seems to bear a relation to an excessive formation of pigment. The two eyes also show melanotic spots in the sclerotic. The vision is normal; the refraction is 0.5 H.

VASCULAR CONGENITAL DILATATION OF THE IRIS. L. HAMBRESIN, Brussels.

The corneal microscope showed, in a young man, aged 21, a dilated and tortuous vessel in the outer half of the iris. This vessel was not placed directly on the iris, but in the tissue of the iris. It did not show pulsation. Dynamometric pressure did not provoke pulsation. The lesion was unilateral; it had existed since birth. The diagnosis of congenital varix was suggested.

It is interesting to note that one day this patient had a large vitreous hemorrhage and two hemorrhages at the limit of the ophthalmoscopic visual field. These two hemorrhages were situated just behind the venous dilatation of the iris. Under these conditions, one wonders if the phlebectasia was not prolonged posteriorly, and if the hemorrhages were not simply the result of a varicose rupture. General examination indicated only an excess of urea in the blood, which was probably the cause of the hemorrhages.

ANNULAR MELANOSARCOMA OF THE IRIS. JULES SZYMANSKI, Vilna.

The annular form of the melanosarcoma of the iris is rare, and its diagnosis in the initial period is difficult. The macroscopic aspect in the light of the slit lamp is that of reddish brown knotlike tumors, of spherical form, which project on the entire surface of the iris across the enlarged and scattered spaces of the stroma of the iris. Hypertension and consecutive cataract resulted in the case described.

After enucleation, histologic examination revealed a typical melanosarcoma, with round and fusiform cells, many of which enclosed pigment.

THE MULTIPLE SOURCES OF THE AQUEOUS HUMOR. MAGITOT, Paris.

In his study of 1916, Magitot concluded that the aqueous humor was a dialysate and that there was no current. Since that time, numerous biochemical investigations have only confirmed the fact that the intra-ocular fluid like the cerebrospinal liquid issues from the blood serum by dialysis according to a thermodynamic mechanism in which Donnan's equilibrium plays a rôle.

In naming the recent investigations concerning the cerebrospinal liquid which only attribute a secondary rôle to the choroid plexuses, and in showing that this liquid is formed at all levels of the neural axis at the expense of the capillaries of the leptomeninges and of the nervous parenchyma. Magitot made a parallel with his conception concerning the origin of the aqueous humor. He maintained that the ciliary body only possesses a dynamic rôle in vision (accommodation), and that the structure of the processes is not particularly favorable to the mechanism of dialysis. The aqueous humor is formed in the eye by that which represents the pia mater and the nervous peranchyma, that is, the uvea, principally the iris and the retina. The ocular liquid dialyzed by the capillaries is absorbed by the same route. Normally there is no circulation in the proper sense of the word; the exit and entrance of the liquid are two phenomena which balance one another and are dependent on the nutritive demands of the nervous cells. Hydrostatic, osmotic, electric and chemical phenomena regulate this production and absorption; this explains the entrances and exits of the liquid according to changes in the molecular concentration of the blood, according to sensory nervous stimulation and according to hydromechanical pressure.

The liquid intra-ocular movements are favored by changes depending on the tonus by the contraction of the extrinsic muscles, by arterial and venous pulsations, which are in turn influenced by the cardiac and respiratory rhythm. It is not, therefore, a matter of stagnation, the term used in 1916, in opposition to the classic theory of a circulating current which does not accord with the conception of dialysis.

Certain waste products are discharged outside the globe in the lymphatics. Aqueous humor is not like the lymph of the glands but communicates with it indirectly. In fact, the author accepts Achard's conception of a lacunar system and recalls the ideas of Mestrezat who considers that the cerebrospinal liquid, the labyrinthine liquids and the aqueous humor are prototypes of an original intercellular liquid. In certain desquamated and isolated biliary passages of the hepatic secretion, a liquid is formed at the expense of the capillaries which is chemically identical.

THREE CASES OF IRIDOCYCLITIS DUE TO TRYPANOSOMES. M. BARGY, Perpignan.

Ocular complications in sleeping sickness are rare. At Haute-Volta, Bargy saw three of 476 cases.

CASE 1.—The patient had a mild typical iridocyclitis in the left eye, a slight blood clot on the iris and hyphemia; he was cured in ten days. The cause was recognized six months later, when the patient returned with symptoms of sleeping sickness.

CASE 2.—The patient had iridocyclitis, a third relapse in the left eye, hemorrhages in the iris, and speudohypopyon of a rusty color. There were evident signs of sleeping sickness, with parasites in the gland juice and aqueous humor. A cure resulted in eight days.

CASE 3.—There was sleeping sickness at the end of the first period in this case of iridocyclitis; a rust-colored aqueous humor and a subepithelial corneal infiltration of the punctate type were present. It was impossible to tap the anterior chamber, but the trypanosome was found in the blood.

Four known characteristics of trypanosomic iridocyclitis should be noted in these three cases; the condition was unilateral, transient, benign and relapsing. If one adds to these the hemorrhage of the iris (hyphemia or rust color of the aequeous humor), one has five signs associated, which, with local endemicity and the general symptoms, make the diagnosis. The diagnosis is confirmed because: trypanosomes were present in the aqueous humor which were obtained by aspiration through the cornea, in order to avoid conjunctival hemorrhage. The usual local treatment was instituted. Atoxyl was used for etiologic treatment.

PARALYSES OF ACCOMMODATION DURING LACTATION. R. PERRIN, Lyons.

Three cases were cited of paralyses of accommodation in lactation. These paralyses are due to general exhaustion. They occur in anemic infants, in the absence of all other cause of infection: diphtheria, syphilis, tuberculosis or dentition. They yield rapidly to the suppression of nursing and to appropriate treatment: pilocarpine, corrective glasses, salicylate of soda and tonic treatment of the weakened body.

PROLAPSE OF IRIS IN THE OPERATION FOR CATARACT WITH DOUBLE NEEDLES. AUBARET, Marseilles.

Simple extraction can be effected to a certainty in all cases. The unusual complication of an iris entanglement can be easily rectified. The technic indicated

is simple and is rendered extremely easy, thanks to retrobulbar and orbicular is anesthesia. The maneuver consists in replacing the iris by traction rather than by forcing it back.

MYDRIASIS BY EPINEPHRINE IN CATARACT EXTRACTION. DE SAINT-MARTIN, Toulouse.

Mydriasis brought about by the injection of one or two drops of epinephrine of 1:1,000 solution under the bulbar conjunctiva has the property of persisting despite the evacuation of aqueous humor, in contrast to mydriasis obtained by the use of atropine or euphthalmine. Magitot, after pointing out this peculiarity, suggested that perhaps here is an advantage in the total extraction of cataract. De Saint-Martin affirmed that in the course of fifty operations this hypothesis was verified: the mydriasis is constant, almost always lasting, and it facilitates the removal of the lens in total or extracapsular extraction.

It is without danger, and it does not predispose to prolapse of the vitreous or to entanglement of the iris. It merits being used in practice, since it renders total extraction more easily and diminishes the risk of secondary cataract.

THE OPEN TREATMENT AFTER CATARACT OPERATION. DANSAN, Auch.

Dansan's long practice (twenty-two years) proves that there is no inconvenience and every advantage in not bandaging the eyes after operation for cataract. The enormous satisfaction of the patient who is not deprived of the light, the rapid closing of the corneal wound, the almost constant absence of redness and irritation of the eye, the great diminution of postoperative pain in all cases in which the operation was simple, and the diminution of postoperative complications should plead in favor of the adoption of this procedure.

PSEUDO-OSSIFICATION OF THE VITREOUS AND PROLIFERANT OSTEOGENIC CYCLOCHOROIDITIS. C. DEJEAN, Montpellier.

Two globes which were atrophied following traumatism, and chronically irritated, contained multiple bony spaces in place of the vitreous. This might lead one to think of an ossification of the vitreous; histologic analysis, however, shows that it originates in the ciliary body and the choroid the conjunctival tissue of which causes a condition of hyperplasia and partly fills the vitreous chamber. Sclerosed and epithelial bands, alternately dense and clear, occupy the whole anterior segment of the cavity. They represent a proliferation of the ciliary body composed of epithelium and conjunctival tissue. The choroid remains in place in spots, but penetrates into the cavity by more or less wide paths. It is at the expense of these immigrating elements that the bony tissue develops. Pigment accompanies the proliferation on all sides.

The study of various previous cases of vitreous ossification leads one to believe that the ciliochoroidal proliferation described constitutes the usual mode of ossification of the vitreous cavity. The vitreous body, a tissue fundamentally deprived of cells, seems of itself incapable of forming bone.

TWO CASES OF GLIOMA OF THE RETINA. TEULIÈRES, Bordeaux.

A few weeks before presentation, Teulières observed intra-ocular tumors in two children, aged 2 and 3 years, which, as to evolution and clinical aspect, presented all the symptoms of glioma of the retina. In one, the pathologic examination showed the classic form of retinal glioma described by Mawas under the name of retinocystoma with stéphanocytes. Photomicrographs showed clearly that

the tumor had originated in the layers of inner and outer granules. In the other was found a tumor of complex structure, with multiple differentiations of nervous, neurologic, pigmentary and hematic character. It seemed to belong to the category of retinomas, perhaps to that of teratomas.

HEMORRHAGES OF THE RETINA IN VAQUEZ'S DISEASE. BOREL, Neufchâtel.

Hemorrhages of the retina occur in those who suffer from policythemia, as a result of excess activity of the bone-marrow, the principal seat of formation of red blood corpuscles. Finally, the normal number of corpuscles is tripled, which gives a purplish as well as a sickly appearance to the patients. Roentgen-ray treatment diminishes the activity of the marrow and reestablishes the normal number of red blood corpuscles; retinal hemorrhages disappear at this time.

Examination of the eye is indispensable to diagnosis; it sometimes precludes surgical operations performed by mistake, and because violent pains in the limbs seemed to call for operation. The iris can change color and become fairly dark, depending on whether an intense monolateral congestion is formed, but not by hemorrhage in the iris. Ophthalmoscopic examination and the spindles of venous dilatation are subject to rapid variations. The venous dilatation of the small retinal vessels can, at times, reach the macula.

RELATIONSHIP BETWEEN ARTERIAL RETINAL TENSION AND TENSION OF THE CEREBROSPINAL LIQUID. DUBAR and LAMACHE.

In eliminating certain errors, such as variations of position and emotional reactions, and after measurements, determination of retinal arterial tension by the Bailliart method gives information of greatest interest on the pathologic variations of the cerebral circulation and of the tension of the cerebrospinal fluid. The information obtained by this method is more exact than that furnished by manometry in the course of lumbar puncture in the cases of development of the subarachnoid septum.

TRAUMATIC DETACHMENT OF THE RETINA IMPROVED IN THE COURSE OF CONSECUTIVE GLAUCOMA. JEAN SÉDAN.

This article will be published in full.

THE PATHOGENESIS OF RETINAL DETACHMENT. MARC AMSLER, Lausanne.

A study of the theories concerning the genesis of idiopathic retinal detachment was made with the help of a table. In spite of opinions and divergent doctrines, the problem today presents some new features which mark a progress in knowledge, and which constitute new points of departure for fruitful research. Less limited than formerly to local intra-ocular processes, the notion of the pathogenesis detachment of the retina extends beyond the narrow limits of ophthalmology and embraces important researches in the field of general pathology. At the heart of the problem is the uveal tract, the true articulation between general pathology and the intra-ocular processes which end in detachment. Spontaneous retinal detachment is, in reality, secondary to disease of the uvea which, in turn, ought to be considered secondary to morbid general phenomena.

RENTS IN DETACHMENT OF THE RETINA. GONIN, Lausanne.

So-called "spontaneous" retinal detachment has for a determinative cause one or several rents which permit the vitreous liquid to pass behind the retina. The closing up of these retinal tears is necessary for a cure. It is necessary to

determine their exact locality in order to be able to reach them by operation. Five sixths of the rents are located in the periphery where they easily escape rapid ophthalmoscopic examination. The difficulty of this ought not to make the practitioner turn aside, for if one succeeds in producing a chorioretinal adhesion at the site of the rent, one can, if the detachment is recent, obtain complete and lasting cure in ten or fifteen days; if the case is old, one can secure an arrest of the detachment, but the reapplication is not always perfect. When these results are not obtained, it means that the rent has not been entirely closed off or that another rent exists; in this way one can explain the frequent relapses which result from most methods of treatment. Operative closing of retinal tears is possible in the majority of cases, and if necessary should be performed without loss of time.

SUDDEN NEURORETINITIS IN COURSE OF A CASE OF POLYSEROSITIS. FRADKINE.

In the course of polyserositis caused by an undetermined pathogenic agent, an infectious neuroretinitis suddenly developed. An intensive treatment by salicylates given intravenously in 3 Gm. doses per day, plus 3 Gm. by mouth, restored the vision in part. This treatment was effective until at a given time there was an arrest in the progress of the cure. Was it because of habit? Because of insufficiency of dose? The question remains unsettled. Vision in the other eye, lost for fifteen years through a similar attack, had also recovered a part of its central acuity. The interpretation of this clinical fact demands elucidation.

DOUBLE OPTIC ATROPHY IN FAMILIAL CEREBRAL DIPLEGIA. C. BOREL.

Besides familial spinal diplegia and mild diplegia of spinal and cerebral origin, there exists a purely cerebral familial diplegia which can be considered as an autonomous entity affecting boys almost solely; through this type, double progressive optic atrophy, spastic diplegia, nystagmus, trouble with speech and progressive idiocy are explained by an atrophy of the white matter of the brain, the gray matter remaining intact. Predilection for the males in this diplegia is related to the same tendency in hereditary optic atrophy, achromatopsia and hereditary nystagmus.

This case confirms the etiology of the consanguinity.

SEVERAL CASES OF OPTIC NEURITIS CURED BY ABLATION OF THE MIDDLE TURBINAL FOLLOWED BY OPERATION ON THE SPHENOIDAL SINUS. E. ESCAT and H. FRENKEL.

If, in a case of optic monolateral neuritis, one can eliminate syphilis, multiple sclerosis, chronic interstitial nephritis or a dental infection, one should consider sinusitis, especially sphenoidal sinusitis. Even if the rhinologic examination shows the absence of all sphenoidal disease, one should consider operation.

Despite the absence of objective signs of sinusitis, a rhinologic operation resulted in a striking improvement of vision, which had been lost through optic neuritis, in seven patients. The operation consisted in ablation of the middle turbinal followed by sphenoidal operation. Whatever the physiologic interpretation of these cures may be, there is no reason, in this day of perfected technic which has made the operation perfectly inoffensive, to allow the optic nerve to become atrophied in cases in which there is hope of cure. The facts known are numerous enough to justify operation.

THE RESULTS OF MEDICAL TREATMENT OF GLAUCOMA AFTER ONE YEAR OF APPLICATION. C. ABADIE, Paris.

For a year, I have had numerous occasions to apply the medical treatment of glaucoma which I praised at the last Congress in 1927. The results obtained have exceeded my hopes. I counted on its efficacy only in chronic forms of slightly elevated hypertension, but I have had success even in cases of acute and subacute glaucoma with elevated tension. At the Society of Ophthalmology in Paris, several times I have shown patients attacked by double acute and subacute glaucoma treated on one side medically and on the other surgically, who have lost the vision of the eye operated on, and conserved intact that of the eye treated medically.

Even in two cases of hemorrhagic glaucoma, which, as you know, is obstinate to all medical or surgical treatment and which often necessitates enucleation, the medical treatment has given good results.

In order to facilitate the administration of this medication, I have slightly modified it; instead of giving the ergotin in the form of pills, I give it in solution added to calcium chloride.

As before, I always prescribe epinephrine hydrochloride 1:1,000 in a dose of from 10 to 12 drops three times a day. I mix the ergotin fluid with the calcium chloride as follows:

	Gm.
Ergotin fluid	2
Calcium chloride	15
Syrup of bitter orange peel	100
Water	100

Two tablespoonfuls a day are given.

The instillations of pilocarpine (0.2 Gm. in 10 Gm. of water) twice a day are sufficient with this treatment. Because of the various communications which I made during the year at the Society of Ophthalmology of Paris with presentation of patients, several eminent colleagues have criticized me severely, some reproaching me for giving patients with glaucoma dangerous illusions, others for having preferred the medical treatment of glaucoma to the surgical. I have already replied to these, and I repeat again that these reproaches are unfounded.

In my communication to the Academy of Medicine, the first in date, I said: "In acute and subacute forms of glaucoma, surgical operations generally give good results, but they carry with them certain risks, as you have observed in the patients which I presented to the Ophthalmological Society of Paris, and there is not one of us who has not had similar vexations."

Here then are important statistics published in the *Clinique Ophthalmologique* of March, 1914, concerning 389 observations of sclerectomy or trephining for various forms of glaucoma which show clearly that failure as a result of surgical operation is more frequent than one would think.

"In 10 per cent the results were clearly bad. Trouble with the crystallin was observed in 4 per cent; posterior synechia in 23 per cent; six eyes became atrophic; 3.4 per cent were enucleated; late infection in 1.3 per cent; loss of the vitreous body was observed in 6.2 per cent, and two eyes were lost by expulsive hemorrhage."

In glaucoma, I have wished neither to oppose the medical treatment nor to substitute it for the surgical procedure, but to augment the means of action against this redoubtable disease, which, perhaps, causes the most blindness. I am convinced that in the case of essential primitive glaucoma, medical treatment will become of greater and greater importance and will perhaps show itself superior to all others. In fact, there is no other, as I pointed out last year, for secondary glaucoma which has a general cause, such as syphilis, bacillary and rheumatismal

infections. The latter type of case is accompanied by inflammatory reactions and lesions of the tissue of the iris which are visible to the naked eye or with the slit lamp, a morbid process which irritates the circular nervous plexus of the iris and provokes secondary glaucoma. These cases always demand treatment directed against the infectious pathogenic state, and, at the same time, iridectomy to remedy adhesions, pupillary occlusions and the accumulation of altered aqueous humor in the posterior chamber.

In any case, what I can say now is supported by a year's experience comprising an important number of patients observed in the various departments of ophthalmology of the hospitals of Paris: Medical treatment, in cases of essential and primitive glaucoma, seems to me destined to render the greatest service and to rescue a great number of patients from blindness.

DISCUSSION

BAILLIART: While acknowledging Abadie as one who has stamped his worth on the clinic and therapy of ophthalmology, I should like to call attention to the fact that it would be dangerous to believe in the absolute efficacy of medical treatment of glaucoma, and to recall to you that the patients presented at the Ophthalmologic Society of Paris had hard eyes.

GLAUCOMA IN TUNIS. CUÉNOD and ROGER NATAF, Tunis.

The rate of frequency of glaucoma in Tunis is high, as in other Oriental countries. Statistics were given comprising 521 cases of glaucoma for a period of six years; 25 cases of acute glaucoma, 261 cases of glaucoma evolutum and 235 cases of absolute glaucoma.

Trachoma seems to have a real influence on the frequency of ocular hypertonia in these countries — an influence which cannot be denied in the case of secondary glaucoma (30 per cent of the cases of glaucoma are secondary to leukoma adherens, the sequel of trachomatous lesions, which remains to be shown for the other forms). Would not the cicatricial transformation of the limbic and perilimbic tissues favor the production of ocular hypertension in certain cases?

The operative method applied for more than twelve years to several hundred subjects — large iridectomy with peripheric incision, and excision of a sclerocorneal strip — has given satisfying results and, furthermore, tends to demonstrate that the glaucomatous eye is little disposed to secondary infection.

DISCUSSION

A. TERSON: With regard to glaucoma in the case of trachoma, I shall recall some related facts which throw light at least partially on its mechanism. 1. Peritomy and peridectomy have more than once provoked a case of secondary glaucoma. 2. In cases of anterior scleroconjunctivitis it happens that, spontaneously, but especially after subconjunctival injections and repeated cautery, the tendency toward ocular hypertension may be manifestly increased. 3. A patient with detachment of the retina, perfectly cured by Sourdille, and presented by me in December, 1927, at the Ophthalmological Society of Paris, was blind in one eye, myopic 20D; the tension of this eye, low at first, was completely reestablished. Now, the subconjunctival injections of cyanide have attached the conjunctiva to the globe and it is clear that this cicatricial and obliterating covering maintains the tension by "colmatage," of which F. Lagrange was spoken, and could, on occasion, raise it. Adhesive pericorneal lesions of trachoma must act in the same way.

TWO CASES OF LEUKOSARCOMA OF THE CHOROID. LACROIX and PAUL PESME.

Two cases were presented that, from the clinical point of view, can be summed up in this way: 1. A woman, aged 38, presented a tumor with retinal detachment visible in the ciliary region after atropinization, which was discovered after several months of observation. 2. A woman, aged 36, presented a tumor covered by the retina, and occupying two thirds of the vitreous. It was visible to the naked eye. From the anatomic point of view: When the tumor albus in the first case was cut, it was formed of spindle-shaped achromatic cells, disposed in a fascicular fashion, or vortically around the new vessels; when the tumor albus in the second case was cut it was in the form of a fungus, occupying two thirds of the vitreous, and was composed of ovoid cells, almost cylindric, achromatic and disposed in palisade form. The first case recalls what it has been agreed to name fascicular leukosarcoma. In the second case, it is the belief that the hypothesis can be retained of a tumor of ectodermal origin, formed at the expense of neuro-epithelial cells which are found in the choroid.

NEW REMARKS ON OCULAR IMBIBITION. BAILLIART, Paris.

The results already published by Bailliart on the imbibition of the enucleated eye plunged in hypotonic solutions, particularly distilled water, were confirmed. The ocular tension and the weight rise, the former more slowly than the latter, but continuing to rise after it (the latter) has ceased; penetration of the liquid takes place especially through the cornea and the limbus.

All eyes do not imbibe in the same way; young eyes are less sensitive. The human eye, especially the glaucomatous one, reacts strongly. Carotid injections of hypertonic or hypotonic liquids give the same results with the eye of the living animal as with immersion of the enucleated eye; hypotonic solutions raise the tension; hypertonic solutions lower it.

In two cases, the decrease of ocular tension in glaucoma through the repeated use of ocular baths with hypertonic serum was observed.

TREATMENT OF SYMPATHETIC OPHTHALMIA. H. VILLARD, Montpellier.

A case of sympathetic ophthalmia occurred in a man, aged 30, twenty-two months after the penetration of a metallic foreign body in the left eye. This patient, who was cured completely and definitely, was treated, in addition to enucleation of the left eye and frequent instillations of atropine in the right eye, by various medications which have been praised as cures for this disease — bloodletting; salicylate of soda, both internally and intravenously; intramuscular injections of milk; subcutaneous and subconjunctival injection of the blood serum of a patient cured of sympathetic ophthalmia; intravenous injections of cyanide of mercury, of neoarsphenamine and of colloidal suspension of silver; intra-orbital injections of a colloidal suspension of silver, and fixation abscesses, as many as three in number. Of these numerous medications, only fixation abscesses and intravenous injections of a colloidal suspension of silver have given favorable results. Without neglecting other means of treatment which constitute a useful adjuvant, one ought especially to try simultaneously and rapidly fixation abscesses and intravenous injections of a colloidal suspension of silver.

DISCUSSION

A. TERSON: One cannot publish too many observations concerning sympathetic ophthalmia, which is sometimes decried and sometimes considered exceptional. Besides the relatively benign cases that have already been cited, in which enucleation alone has sufficed, there are also fatal cases, in spite of all one can do. There are strange cases which come after a delay. Such a one I am following now.

A year and a half after a subjective and objective cure which seemed perfect, an attack of acute iridocyclitis developed, despite the patient continuation of medical treatment.

Even with enucleation, all medicinal treatments can, depending on the individuality of the illness, succeed totally or in part, improve momentarily, become exhausted or fail sooner or later. This holds true also for fixation abscesses which I was the first to use in sympathetic ophthalmia.

PATHOGENIC CLASSIFICATION OF CONVERGENT STRABISMUS. RENÉ ONFRAY, Paris.

Convergent strabismus is a syndrome which comprises two cardinal signs: deviation of the globe and arrest in the development of binocular vision. This syndrome is encountered in four groups at least, and each differs from the other in its pathogenesis: (1) simple hypermetropic strabismus, in which cure may be produced through the wearing of glasses, and in which the Donders theory on the relations of convergence and accommodation has an almost exclusive value; (2) strabismus with probable lesion of the macular bundle of one of the eyes in which one sometimes finds a central scotoma; (3) concomitant strabismus following oculomotor paralysis; (4) strabismus with equal visual acuity in both eyes, and probable lesion of the centers of oculomotor coordination, real infantile encephalopathy.

It is by making these various groups and by following physiopathologic and pathologic researches in these four directions that one will be able to throw light on the complex pathogenesis of strabismus.

BINOCULAR ALTERNATION. DIAZ-CANEJA, Palencia.

Bose's theory of binocular alternation supposes that binocular vision is made by the "successive" association of retinal images. One eye sees while the other rests.

Stereoscopic outlines, in which the alternation is not made between one retina and the other, but between different parts of the retinas, correct Bose on this point, and place the phenomena of alternation in the domain of the cortical association centers of vision.

OSTEOSARCOMA OF THE ORBIT. NIDA.

A woman, aged 28, was suffering from irreducible exophthalmos (right eye), with deviation of the globe downward and out; this had appeared at the age of 8 years, as shown by photographs made at that time. There was hard, painless tumefaction projecting under the skin in the supero-internal angle of the orbit. The ocular motility was perfectly conserved. The visual acuity was normal after optical correction. The eye was normal. The results of the rhinologic examination were negative. Radiography showed a dilatation of the right frontal sinus, which projected not only into the orbital cavity but even into the anterior fossa of the skull, though remaining permeable to roentgen rays. The case was considered a frontal mucocele. After incision along the right eyebrow, the anterior wall of the sinus was exposed; it was reduced to a fine bony lamella under which was discovered a resisting mass of a rosy color, soft enough to be cut by the curet. Histologic examination revealed the osteosarcomatous nature of the tumor. Recurrence occurred after six months.

DIVERSE VARIETIES OF CYSTS IN THE HYPOPHYSEAL REGION. BOURQUET, Montreal.

With embryologic data as a basis, the photographs show that six varieties of cysts can be found in the hypophyseal region. Four are intracellular and

two are supracellular. The first four which develop in the interior of the sella occur as degenerative Rathke's pouches.

The two others which are of intracranial development arise from Rathke's pouch or from nervous prolongation.

The aviator must use the separative power of his eye by dim light; in this way he must distinguish the shape of objects in order to recognize the ground, and direct his course by night. This isolating retinal function is measured by visual acuity.

All things being equal, as far as ocular diopters and the diaphragm of the iris are concerned, discernment of the shape of an object is the function of the angle under which it is seen, of the illumination of the object, of the capacity of the retina to adapt itself to the illumination in which the eye is found.

In order to investigate the amount of visual acuity at night in the average man, the following method was used: 1. Men, about 20 years of age, entirely normal from the visual point of view, were chosen as subjects. 2. As a test, Landolt's ring, of a size appropriate to these investigations, was used. 3. Illuminations were used that were always comparable in quantity and quality; then artificial illuminations were produced by means of standard lamps fed on exact electrical current, and reduced in known proportions, by means of Tscherning's photometric glasses. 4. The illumination used was physiologically comparable to that of a clear night, without a moon, in a place completely deprived of artificial lights. The illumination thus determined corresponded closely to 0.0015 lux.

The experimentation led to the following conclusions: In illumination of 0.0015 lux, the visual acuity of a normal young man is between from six to nine hundredths of the normal daytime acuity; from the ages of 20 to 65, it diminishes appreciably; the vision of ametropic persons is sometimes deficient at night, especially in those who are hypermetropic or astigmatic.

It was found, therefore, that in young normal people a difference equivalent to 33 per cent exists between the best and the least favored subjects, from the point of view of efficacy of vision at night.

The difference of visual functional value, which these variations in visual acuity by night can establish between various subjects, would seem to imply a special selection of those destined to do certain nocturnal work, such as flying an airplane, a selection founded at the same time on the measure of the acuity, of adaptation and on the rapidity of adaptation.

The amount of visual acuity in the daytime does not imply that of the separative power by night.

Ocular Tuberculosis Treated by the Methylic Antigen of Négre and Boquet. A. Magitot and Y. D'Autrevaux, Paris.

Methylic extract of tubercle bacilli (prepared by Boquet and Négre at the Pasteur Institute), well known already in the therapeutics of different manifestations of bacillary infection, has been utilized in several cases of ocular tuberculosis. A patient with phlyctenular keratitis with nasal lupus and three patients with iritis were cured; one patient with interstitial keratitis was improved.

The treatment is simple, but must be carefully watched: subcutaneous injections are given twice a week in increasing doses of methylic antigen diluted to one-tenth, at first, later pure (it can be procured at the Pasteur Institute); from thirty to forty injections are necessary. They rarely cause general reactions, never local ones. This antigen is at least as effectual as the sensitized vaccine, and is used in the research of tuberculous antibodies. The Boquet-Négre reaction is as useful and as valuable as that of Bordet-Wassermann.

W. Ostwald's Theory of Colors. Marcel Dufour, Nancy.

Prof. Wilhelm Ostwald's theory of colors has the advantage of leading to practical methods which permit the classification of colors by the amounts of white, black or colored tints which they contain. The measuring of these three components is done by means of an apparatus simple enough to be used in industrial practice.

Ostwald has been able to produce a chromatic circle in which the colors are so distributed that the shading between two consecutive colors is psychologically constant, and two complementary colors are always placed at the two extremities of the same diameter.

The ideas and methods of Ostwald have not escaped criticism; nevertheless, it would be interesting to make them known to French oculists; for Ostwald's chromatic circle can be of great service to those who are interested in physiologic optics.

Book Reviews

EDITED BY DR. FRANCIS HEED ADLER

REPORT OF THE GOVERNMENT OPHTHALMIC HOSPITAL, MADRAS, FOR YEARS 1924 TO 1927. BY COL. K. E. WRIGHT. Madras: Government Press.

About 1,500 cataracts are extracted yearly; generally a capsulotomy is performed. The results do not differ from those of preceding years. With great justice, the author speaks of the inadequacy of statistics to determine results and of the necessity for a personal examination to discover whether the iris, capsule of the lens and chamber have maintained their relative position.

Treatment for prolapses and impactions of the iris consist of drops of picric acid and instillations of eserine. Large prolapses are reduced by heating with the actual cautery and are allowed to form a layer of epithelial cells; some are covered by a flap before the patients are discharged. In 1925, delayed formation of the anterior chamber of the eye was observed in twenty-seven cases. If the chamber remains empty for two or three days, a central U-shaped corneal opacity frequently is set up. This is permanent in the severe cases and is sometimes caused, in the author's opinion, by the pushing forward of the iris diaphragm in cases predisposed to glaucoma, or by tags in the section. Treatment consists in heating the lips of the wound with the galvanocautery, in the administration of drops of dionin or the subconjunctival injection of mercurocyanide (1:4,000). Further studies were made on the evidence of uveal disease in cases of cataract, and on the poor dilatation of the pupil in dark brown iris by mydriatics. Investigations on the relation of glare and bright light to the frequency of cataract were begun. Blocking of the facial nerve in cataract work (ARCH. OPHTH. **52:** 166 [March] 1923) continued to give good results.

Escape of vitreous occurred in 146 of 1,601 extractions in 1926; late formation of the anterior chamber of the eye was observed in 3 per cent. There were four cases of panophthalmitis, four of choroidal hemorrhage and three of turned sections. In general, a conjunctival flap is regarded as objectionable as it produces a hemorrhage into the anterior chamber, at the time of operation, which is likely to result in pigmented bands on the capsule of the lens, obscuring vision and rendering needling difficult. Blocking of the facial nerve at the stylomastoid foramen has become a routine procedure. Deep injections in the neighborhood of the ciliary ganglion are not made to a great extent, as they may have a detrimental effect on the healing of the section.

Careful consideration of the causes of iritic reaction after extraction resulted in the conviction that it was a great disadvantage to leave blood in the anterior chamber. The author does not think that the capsule alone can give rise to postoperative iritis; nor does he think that a properly conducted needling exposes the patient to any risk, although it makes another operation necessary.

Interesting investigations were made of the sterility of the conjunctiva in work on cataract. Notwithstanding thorough preparation following Herbert's method, the field of operation in more than 45 per cent of the cases was found to harbor organisms, generally the staphylococcus, and the possibility of infection, therefore, cannot be excluded in explaining iritic reactions.

The rate of 8 per cent given in previous years for prolapse of the iris was found to be incorrect on careful analysis; the actual rate for 1926 was 2.6 per cent. The falling back of the cornea after section and the gaping of the section seem to occur more frequently among Indian patients than among others.

Sclerocorneal trephining for glaucoma was performed on an average of 150 times a year.

The author questions which property of the disordered vitreous it is which in advanced cases reestablishes high tension almost instantly after its relief by evacuation of the anterior chamber. This fact presupposes a disorder of the mechanism of secretion. The author suggests investigation of the chemical changes in the abnormal vitreous.

In 1925, the changes of the vitreous in glaucoma were studied and observations on the chemical composition of the vitreous in glaucomatous and normal eyes are reported, (ARCH. OPHTH. **57**: 480 [Sept.] 1928).

In 1927, investigation of the lowering of the intra-ocular tension by the intravenous injection of a hypertonic solution of sodium chloride led to the following conclusions:

1. Therapeutically, the injection of a strong solution of sodium chloride is a valuable means of lowering the intra-ocular tension, effective in the great majority of cases, especially as a preoperative procedure.

2. Following the injection, the intra-ocular tension falls and the osmotic pressure of the blood rises, in spite of a large increase in blood volume. It remains to be shown, however, whether or not the fall in intra-ocular tension is more closely connected with the osmotic pressure than with other changes in the constitution of the blood.

Each year a number of important and interesting clinical cases are reported, including cases of rare orbital lesions. They are frequently illustrated and are supplemented with a pathologic and bacteriologic examination. One cannot help but marvel at the amount of work accomplished under conditions that are often trying. The wealth of material is astonishing and the director and his staff are to be congratulated on the success with which they have taken advantage of these unusual opportunities for medical aid and research.

THE DEVELOPMENT OF THE HUMAN EYE. By IDA C. MANN, M.B., F.R.C.S., assistant surgeon, Royal London Ophthalmic Hospital; pathologist, Central London Ophthalmic Hospital. London: Cambridge University Press, published for the British Journal of Ophthalmology, 1928.

As Sir John Herbert Parsons says in his foreword, "hitherto there has been no comprehensive monograph in English devoted to the embryology of the human eye." This gap has now been filled by the publication of Dr. Mann's excellent book. In it are considered all

stages in the development of the eye and adnexa from the earliest embryonic condition, through fetal and postnatal stages up to maturity. In order to give the reader an insight into the environment in which the first beginnings of the eye appear, the early stages of the embryo are outlined in Chapter I. Then follows a general outline of the development of the optic vesicle and the associated mesoderm in Chapter II. Separate chapters are devoted to the lens, the vitreous and suspensory ligament of the lens, neural ectoderm and its derivatives, the associated mesodermal structures, and the orbit and its contents. In the concluding chapters are given the phylogenetic development and morphology of the human eye, and a synoptic comparison of ocular with general development. There is appended a selected bibliography of recent research.

Throughout the book, one is struck by the numerous original figures, which aptly illustrate the text. The drawings from the models give the three dimensional idea in a helpful way, and the author's studies on the choroidal or fetal fissure contribute to the clarity of the exposition of that transitory but important structure. The descriptions of the lens sutures, the four stages of the formation of the vitreous, and the blood vessels of the pupillary membrane and iris at various ages are all carefully and clearly written. Indeed everywhere one recognizes the first-hand acquaintance of the writer with the subjects discussed, and feels the enthusiasm with which the studies were made. Frequently, when an explanation is helped by recourse to the results of experimental work, comparative histology or embryology, these are given. This is especially true of the consideration of abnormalities, many of which are of practical interest. One may state with confidence that this work will be of value to every one interested in the eye.

THE PRESCRIBING OF SPECTACLES. By A. S. PERCIVAL, M.A., M.B. Third edition. Price, 15 shillings. Pp. 239, with illustrations. Bristol, England: John Wright & Sons Ltd., 1928.

This book is divided into four chapters describing, respectively, accommodation, static refraction, faulty tendencies and deviations of the ocular muscles and optical section.

The first twenty pages, devoted to a discussion on accommodation, its mechanism and disorders, contain many references to the masterly work of Duane on this subject as well as to his tables on the variations of accommodation according to age. This is made an interesting section by clear and concise wording.

The next chapter, which is on static refraction, contains a description of all the commoner methods of determining the exact refraction. The author gives a minute description of his technic in retinoscopy for which he prefers a concave mirror. He does not have great faith "in the ophthalmometer as an instrument of precision because it merely gives the power of the cylinder, which, if placed in contact with the cornea, would correct the anterior corneal astigmatism." He shows how the true refractive power of a cylinder, when placed at the anterior focal plane, varies with the spherical refraction of the eye. He gives tables of these values that should prove useful to those who make routine use of this instrument.

In the section on muscular anomalies he discusses the various systems of nomenclature of prisms and gives his reasons for advocating

the general adoption of the centrad as the official unit. The usual tests for heterophoria are outlined, and preference is expressed for the use of the Maddox rod. The author advises against the correction of a hyperphoria of low degree unless symptoms of the defect are discoverable. His treatment of exophoria conflicts with the experience of the reviewer who has had little success with prismatic correction of this type of muscular imbalance.

The closing chapter, which is devoted to the explanation of the rules and formulas stated in the preceding pages, contains the mathematical solution of problems such as the cylindrical effect of tilted spherical lenses, the power of an oblique cylinder, and the value of periscopic lenses.

In this volume the author has so clearly demonstrated the immense clinical value of a knowledge of physiologic optics that it merits careful reading by every ophthalmologist.

OOGHEELKUNDE VOOR DEN ALGEMEENEN ARTS. By PROF. G. F. ROCHAT, M.D. Pp. 351, with 183 illustrations. Groningen: G. Naeff Gravenhage, 1928.

Professor Rochat has written a book for the general practitioner, based on letters which the patients of his ophthalmic clinic bring from their family physician. The letters prove that the family physician gives first aid in accidents, treats light external inflammations and prescribes simple spectacles. In serious diseases of the eye he makes a tentative diagnosis and advises consultation with the specialist; he also appreciates the value of an ocular examination for making or confirming the diagnosis of the general disease.

In this book, anatomy, physiology and pathology are hardly touched on. The reader is supposed to remember them from his study at the university. The section dealing with treatment is larger than necessary for the direct needs of the general practitioner. Present day diagnostic and therapeutic methods are so described as to enable the family physician to understand and explain to the patient the treatment ordered by the specialist.

In the reviewer's opinion, Professor Rochat has undertaken a difficult task.

The book can be read with pleasure, but leaves a final impression of dissatisfaction. Although it contains what should be known on leaving the university, it is not adapted for the man who has been in practice. How often does a general practitioner have to deal with tuberculosis of the conjunctiva? How often has the average ophthalmologist seen an eyelash in the lacrimal canaliculus? Everything is mentioned in rather a fragmentary style.

Psychologically, it is interesting to note that a university professor writes this kind of book. Its value will undoubtedly be judged by the wide-awake general physician.

THE TREATMENT OF CATARACT. By LIEUT. COL. HENRY SMITH, I.M.S. (retired). Price, 15 shillings, 6 pence. Pp. 287. London: Butterworth & Company, 1928.

The first edition which appeared in 1910 served, as the author correctly states, to draw attention to the intracapsular method of extraction of cataract. The interest in this operation led to various modifications

and changes in the technic, such as preliminary dislocation with capsule forceps and the Barraquer suction apparatus. The author has been induced, therefore, to review the whole subject in this much enlarged new edition.

Chapter 1 takes up the clinical examination of the eye, the classification and diagnosis of cataract and the treatment to which each variety is suited. Colonel Smith suggests, as an original and practical classification of the life cycle of the cataractous lens, the incipient stage of senile cataract, and then a final stage occurring in two forms, one hypermature "ab initio" and the other, after the stage of immaturity, becomes a mature morgagnian or a mature hard cataract, which proceeds to become a hypermature morgagnian or hard cataract.

Colonel Smith's favorable results with subconjunctival injections of cyanide of mercury in incipient cataract are mentioned. The writer is not in favor of any method of artificial ripening, nor does he favor capsulotomy during the immature stage of the cataract. He states that all cataracts in senile persons call for intracapsular extraction.

Chapter 2 deals with the operative technic. To page 114 this part is much the same as in the first edition. Colonel Smith is opposed to any method of intracapsular extraction which necessitates the employment of an intra-ocular instrument. On a return visit to the Punjab in 1925-1926, he worked out a method of slow delivery of hard cataracts by pressure from without, by means of a squint hook over the sclerotic below, behind the lens. A spatula is placed above with its convex side backward over the incision, to prevent the forward movement of the lens; the lower border has no option then but to come forward and "tumble." The following warnings are given: 1. Between pressure with the lens hook and the spatula, a swollen morgagnian cataract may be caught between the two instruments and burst. 2. The hook must be applied well below and behind the lower border of the lens so that the border will come forward.

Colonel Smith regards this method as simple and easy to learn, and he believes that in all but the clumsiest hands it should prevent entirely the escape of vitreous. He adds "that the time is not far distant when Daviel's operation will be but a tradition of the fathers, and when Barraquer's vacuum spoon will share a shelf in the museum with all the varieties of Kalt forceps, to be inspected as objects of historical interest. For the two methods which I have described of delivering the soft and the hard lens as 'tumblers' by external pressure alone are so simple and so efficient that they are bound to prevail the world over."

In addition to the routine after-treatment, a discussion of the Barraquer operation by J. Russell Smith is added, as it appeared originally in the *British Journal of Ophthalmology*.

A chapter on couching of the lens and one on the treatment of glaucoma follow. Finally, an appendix contains the following articles, published previously:

"Details of Vision of 132 Cases of Intracapsular Extraction of Cataract on Discharge from Hospital," Lieut. Col. Henry Smith, C.I.E., I.M.S.

"The After-Effects of the Escape of Vitreous During the Operation of Extraction of Cataract in the Capsule by Smith's Method, with an Analysis of Ninety-Eight Cases so Complicated," Lieut. Col. A. E. J. Lister, F.R.C.S., I.M.S.

"Late Results of Intracapsular Extraction," Dr. Arnold Knapp, New York.

"On a New Method of Curing Cataract by Extraction of the Crystalline," the translation of M. Daviel's original paper published in 1748, by the late Dr. D. W. Greene of Dayton, O.

There can be no doubt that the maneuver of "tumbling" is the safest procedure in intracapsular extraction. If the new technic which Colonel Smith's genius has given us accomplishes all that he claims, and is available for operators of moderate opportunities, the author is to be congratulated for having perfected a method of operating with which his name is closely identified, and of which he has always been a valiant champion. In any case, progress is being made and a satisfactory method of intracapsular operation will be developed, and the credit is due the author as the originator of the operation.

DER GRAUE ALTERSSTAR SEINE URSACHEN UND SEINE NICHTOPERATIVE VERHANDLUNG. By PROF. DR. A. SIEGRIST. Price, 36 marks. Pp. 399, with 93 illustrations. Berlin: Urban & Schwarzenberg, 1928.

Since the advent of the slit lamp microscope and the introduction of more delicate methods for biochemical analysis of fluids and tissues, knowledge of the morphology and chemistry of the normal lens and of cataracts has widened considerably.

Siegrist makes the ambitious attempt to take another long step in the study of cataracts. He tries to elucidate the etiology and pathogenesis of senile cataracts and to prove the possibility of preventing the development of opacities in the aging lens, of arresting the process, once started, and even of clearing up the lenticular opacities.

The author presents the historical background of the subject as a preface to his own investigations, and he succeeds in capturing the total attention of the reader. He reviews all that was done and said on this intricate problem from the time of Cornelius Celsus, nineteen centuries ago, until the present day. It took ophthalmologists 1900 years to discover that cataract consists of a loss of transparency of the lens. No one can tell how long it will take to uncover the mystery of the causes and nonoperative treatment of senile cataracts.

The most important part of the book describes the author's own clinical and experimental studies of the etiology and medicinal treatment of cataract. He reports results from the use of the slit lamp in a case of cataracta myotonica and in a few cases of endocrine dermatoses with cataracts. He tries, thus, to build up gradually the relationship between cataracts and endocrine dysfunction. Further proof of his theory lies in studies of the lens in dogs, rats and rabbits after the extirpation of the thyroid, parathyroid and genital glands. He makes interesting and suggestive observations regarding the appearance of lenticular opacities only in animals with tetany, the prevention of the lenticular changes and of tetany by the administration of calcium, and the discovery of the fact that the process of opacification begins underneath the capsule.

Arriving at the question of whether the senile cataract is only one of the many manifestations of senility that cannot be avoided (Vogt), he gives in great detail the ideas of the outstanding workers on the prob-

lem of rejuvenation (Steinach, Voronoff and Harms) and concludes that senility is not an unavoidable and unescapable condition. He attributes the chief cause of aging to the failure of the endocrine glands, and he expresses the firm belief that senility in general and especially the senile processes in the lens can be arrested, deferred or even made to recede by the administration of the proper hormones.

Since the correctness of a theory depends chiefly on facts, Siegrist concludes by reporting summarily the cases of thirty-two patients with senile cataract who were treated with hormones. These hormones, which he administers in tablet form, are called Euphakin and contain extracts of the thyroid, parathyroid and genital glands. The patients were under observation for from two to three years; some of them conserved their vision, while in others it was improved from 0.1 to 0.3. The lenticular opacities remained practically unchanged. The patients who discontinued the treatment for from six to twelve months showed a deterioration of vision.

The book is well written and instructive. Too much emphasis has been placed on the detailed reproduction of the theories and experiments on rejuvenation, and too little on the reporting of clinical material. A detailed report of each case treated would have been more convincing to the skeptic, than theories or historical data.

The author will have to overcome many difficulties and objections before his ideas are accepted. Axenfeld pointed out long ago that improvement in vision may be due to other causes than the clearing up of lenticular opacities, that the cataractous lens may undergo spontaneous changes resulting in improvement in vision and that even the psychic condition often has a great deal to do with the increase or decrease of visual acuity.

If there is any truth in Siegrist's belief that the senility can be influenced, deferred or made to recede, why should the aging lens be an exception? Or is Aldred Scott Warthin right when he warns that "for those who live to their biologic limit senility cannot be escaped; nor can it be deferred, nor is rejuvenescence possible"? But scientists often show a sublime obstinacy in confronting unsurmountable difficulties.

Directory of Ophthalmologic and Otolaryngologic Societies *

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SECTION ON OPHTHALMOLOGY

Chairman: Dr. Edward B. Heckel, Jenkins Arcade Bldg., Pittsburgh.
Secretary: Dr. William C. Finnoff, Imperial Bldg., Denver.
Place: Portland, Ore. Time: July 10-12, 1929.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Harris P. Mosher, 828 Beacon St., Boston.
President-Elect: Dr. William H. Wilder, 122 S. Michigan Ave., Chicago.
Executive Secretary: Dr. William P. Wherry, Medical Arts Bldg., Omaha.

AMERICAN OPHTHALMOLOGICAL SOCIETY

President: Dr. Walter R. Parker, David Whitney Bldg., Detroit.
Secretary: Dr. Emory Hill, 501 E. Franklin St., Richmond, Va.
Place: Hot Springs, Va. Time: June 10-12, 1929.

LOCAL

SECTION ON OPHTHALMOLOGY AND OTO-LARYNGOLOGY OF THE MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA

Chairman: Dr. Walter A. Wells, 1606 20th St. N. W., Washington.
Secretary: Dr. J. N. Greear, Jr., 1740 M St. N. W., Washington.
Place: 1718 M St. N. W. Time: 8 p. m., third Friday of each month.

ATLANTA ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. Arthur J. Fort, Medical Arts Bldg., Atlanta, Ga.
Secretary: Dr. Leon E. Brawner, 157 Forrest Ave. N. E., Atlanta, Ga.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: 8 p. m., last Thursday of each month.

INDIANAPOLIS OPHTHALMOLOGICAL AND OTO-LARYNGOLOGICAL SOCIETY

President: Dr. Lafayette Page, Hume-Mansur Bldg., Indianapolis.
Secretary: Dr. Kenneth L. Craft, Hume-Mansur Bldg., Indianapolis.
Place: University Club. Time: 6:30 p. m., second Thursday of each month from October to May.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

NEW ORLEANS OPHTHALMOLOGICAL AND OTOLOGICAL SOCIETY

President: Dr. J. Raymond Hume, Maison Blanche, New Orleans.
Secretary-Treasurer: Dr. W. A. Wagner, Pere Marquette Bldg., New Orleans.
Place: Eye, Ear, Nose and Throat Hospital, New Orleans. Time: 8 p. m., third Thursday of each month from September to June.

THE OPHTHALMOLOGICAL AND OTO-LARYNOLOGICAL SECTION OF THE CLEVELAND ACADEMY OF MEDICINE

Chairman: Dr. A. B. Brunner, Guardian Bldg., Cleveland.
Secretary: Dr. A. L. Stotter, 1148 Euclid Ave., Cleveland.
Place: Winton Hotel. Time: Fourth Friday of each month.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

Secretary: Dr. Samuel H. Wilkins, 270 Commonwealth Ave., Boston.

PACIFIC COAST OTO-OPHTHALMOLOGICAL SOCIETY

President: Dr. Robert R. Hampton, Boston Bldg., Salt Lake City.
Secretary-Treasurer: Dr. Walter F. Hoffman, 817 Summit Ave., Seattle.
Place: Salt Lake City. Time: July 1-3, 1929.

THE MEMPHIS SOCIETY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

Chairman: Each member, in alphabetical order.
Secretary: Dr. R. O. Rychener, Exchange Bldg., Memphis, Tenn.
Place: Eye Clinic of Memphis Eye, Ear, Nose and Throat Hospital. Time: 8 p. m., second Tuesday of each month.

DALLAS ACADEMY OF OPHTHALMOLOGY AND OTO-LARYNGOLOGY

President: Dr. John G. McLaurin, Medical Arts Bldg., Dallas, Texas.
Executive Secretary: Dr. W. Mood Knowles, Medical Arts Bldg., Dallas, Texas.
Recording Secretary: Dr. L. M. Sellers, Medical Arts Bldg., Dallas, Texas.
Place: Dallas Athletic Club. Time: 6 p. m., first Tuesday of each month from October to June. The November, January and March meetings are devoted to clinical work.

THE MILWAUKEE OTO-OPHTHALMIC SOCIETY

President: Dr. L. P. Allen, 145½ Main St., Oshkosh, Wis.
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